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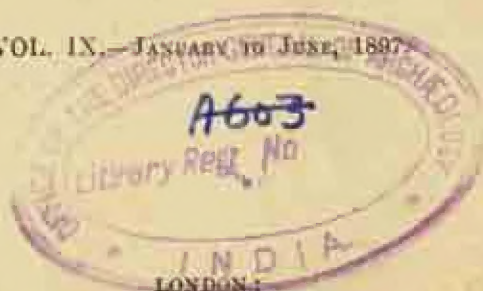
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The Geographical Journal.

No. 1.

JANUARY, 1897.

VOL. IX.

A JOURNEY THROUGH THE MALAY STATES OF TRENGGANU AND KELANTAN.*

By HUGH CLIFFORD.

THE geographical knowledge of the average Englishman, in spite of the work which has been accomplished by the great Society whose members I am privileged to address to-night, must, I am inclined to think, be somewhat vague, or people living in the Malay Peninsula would not so constantly be entrusted with parcels for persons stationed in India, or pestered with inquiries as to the health of dwellers in Shanghai and Yokohama. My audience this evening, however, is not, I take it, composed of average Englishmen possessed of only the average knowledge of geography, and to most of you the locality of the various countries of the Earth are probably known with sufficient accuracy. Africa has been explored and re-explored during the last decade to such an extent that it no longer merits the name of the Dark Continent; Central Asia, too, has been forced of late years to yield up many of its secrets to energetic explorers; and all over the world the hidden things of darkness are daily being brought to light by adventurous spirits, not a few of whom, we may be proud to remember, are members of the great British race. It is comparatively difficult, therefore, to find at the present time any places on this over-handled Earth which are unknown alike by name and reputation to most students of geography, and which have never previously been trodden by the feet of European explorers.

It chanced that my duty took me into such a place in the spring and early summer of last year, and I propose this evening to give some account of the country we traversed and of our journey through it. If

* Paper read at the Royal Geographical Society, April 27, 1896. - Map, p. 120.
No. 1.—JANUARY, 1897.]

I am right in thinking this little corner of the Earth so completely unknown, few here present will be familiar with even the names of Trengganu and Kelantan, and if I therefore begin by stating somewhat elementary facts as to the exact spot occupied on the Earth's surface by the States which bear these names, I trust that I shall not be considered to be performing a work of supererogation.

Trengganu and Kelantan, then, are situated on the east coast of the Malay Peninsula, which, as everybody knows, is the little tongue of land which projects at the extreme south of the Asiatic continent. This Peninsula is divided up into a number of Native States, of which some are under the protection of Great Britain, some acknowledge the suzerainty of Siam, while others claim to be independent.

The straits of Malacca have from time immemorial been a highway of communication between India and the Far East; and, owing to their geographical position, the Malay States on this seaboard—that is to say, on the west coast of the Peninsula—have been more easily opened up than those on the east coast, and have therefore now reached a comparatively advanced stage of civilization. The states of Perak, Selangor and the Negri Sembilan have now for many years been included in the British Protectorate, and roads and railways, and churches and schools, have followed in the train of the British Residents and their staffs.

The state of Johor, though it has always maintained its independence, owes to its proximity to Singapore, a form of government which has been closely modelled on European lines. Many of the gross abuses which are apt to disfigure the rule of independent Malay princes have been done away with, and Johor is now to all intents and purposes a civilized Native State. The state of Kedah is in the Siamese Protectorate, and is outside our sphere of influence. Owing to its proximity to Penang, it is comparatively civilized, though it is to be feared that it is in some ways as misgoverned as are the other and more remote Malay States.

All the other territories on the western seaboard are being rapidly developed, and every one of them is open to European enterprise; but on the east coast of the Peninsula things are different. The sea-routes to Siam, to the French colonies, and to the Far East generally, traverse the China Sea at great distances from the eastern shores of the Peninsula, and the Malay States on this coast do not, therefore, occupy a geographical position which is favourable to their rapid development.

In 1888, Pahang—the most southerly of the Malay States on the east coast—was placed under British protection. This was the first step towards opening up this side of the Peninsula, and large sums of English money have since been invested in the gold and tin mines which are now developing the resources of Pahang. Since then a considerable number of small merchant vessels have plied regularly up the coast to the ports of Pahang, Trengganu, and Kelantan, but none the less the

whole of Trengganu and large tracts in Kelantan remained unexplored until last year.

The state of Trengganu is bounded by the China Sea on the east, by Kelantan on the north and north-west, and by Pahang on the south and south-west.

Kelantan is bounded by the China sea on the east, by Trengganu and Pahang on the west and south-west, and by the Siamese protected states of Loegeh and Patani on the north and north-west.

The area of Trengganu is roughly estimated at 50,000 square miles, and that of Kelantan at 100,000 square miles.

The physical characteristics of the States on the east coast of the Peninsula are common to one and all of them. The north-east monsoon, which sweeps across the China sea from the beginning of November



OFF THE COAST.

to the end of February in each year, lashes the waves into huge breakers, which, dashing themselves upon the shores, keep the beaches free from the dismal mangrove swamps which do so much to disfigure the scenery in the straits of Malacca. From the mouth of the Kelantan river until Johor territory is reached, a bright yellow line of fine sand, strewn with marvellous shells, stretches along the seashore, and is only interrupted here and there by the massive rocks of some bold headland, which juts out into the sea and stubbornly presents its weather-beaten face to the lashings of the wind and waves. During the season at which this monsoon blows the navigation of the coast is rendered exceedingly difficult. Entrance to the mouths of the largest rivers can only be effected once a fortnight at spring tides, and even then, if the wind chances to be violent, the passage is not unattended with danger. When I was first deputed to take up my residence in Pahang early in 1887, no attempt had ever been made to enter these rivers during the close season, and it was not until Pahang had been a year under the protection of the British Government that a vessel was chartered to make the attempt. Since then a regular fortnightly mail service has been organized, and the east coast is therefore no longer so entirely cut off from the rest

of the world during the winter months as was the case until the English began to have a foothold in these states.

During the rest of the year, that is to say, from the beginning of March to the end of October, the China sea is generally perfectly calm. The blue waves lap lazily against the sandy shores, and the *cassuarina* trees shiver in the light breeze. At dawn the wind awakes and blows from the shore, then dies down until the afternoon breeze arises and blows inland again. This occurs almost unfailingly, and the morning land wind takes out with it large fleets of native fishing-smacks with their broad palm-leaf sails, which in the afternoon are wafted in again by the evening breeze.

Inland from the coast to the centre of the Peninsula, the country is covered by one enormous forest. Those who have never seen a Malayan jungle can with difficulty picture such a tangle of vegetable growths. Gigantic trees rear their crests 100 feet from the ground, the trunks often running 80 feet sheer without fork or branch. Around these monsters, and pressing as close to one another as a crowd at a theatre exit, other and lesser trees push and crush their way upwards, fighting among themselves for every square inch of available space. Round about their roots and the bases of their trunks, brambles and thorns, and creepers and undergrowth, such as, I believe, are to be seen in no other part of the world, twine and lace, and intertwine and interlace, in one huge intricate and entangled web of living vegetation. Parasitic growths, some serpentine and immense, with the slow persistent strength of time itself, eat their way half through the gnarled barks of the hardest and hardiest trees; others, graceful and beautiful with a thousand shades of delicate colouring and splendid flowers, hang in festoons from the branches of the trees, which they ornament, canker, and destroy. The whole reeks with the damp smell of rotting and growing green-stuff; the rich soil underfoot is dank with the decaying leaves, which give life to the trees and shrubs and creepers above them; and in these forests there reigns by day a perpetual gloom and silence. Even the fierce tropical sun cannot pierce the tangle of branches and leaves, and the jungles are dark almost before the sun sinks.

Through the forests a few tracks—the merest footpaths—run from point to point, and are kept open by the traffic of successive generations of men. An occasional giant tree, bearing to the earth all surrounding growths, raises here and there a barrier 20 feet high by falling across a path, and a fresh track is cut around it. For the rest, however, the greater portion of the forest remains untrodden even by game, for the heaviest beasts of the jungle are almost powerless against these masses of vegetable growth, and, like the human beings, they come and go, for the most part, by well-worn paths.

The whole country is watered by innumerable streams. In Trengganu alone there are no less than twelve rivers which fall into the sea.

-each one of which has a separate river-basin. The country consists of a number of small hills, and in the gaps between each one of these there is a stream of more or less magnitude. The rainfall is a heavy one, and the dew, which condenses on every leaf and blade of fern and grass, is itself as heavy as rain. If half the water in the Peninsula could be diverted to Queensland, two of the finest countries of the world would result, for while the latter is cursed by long droughts that cripple its prosperity and hamper its development in every way, the Malay Peninsula suffers from an excess of moisture which causes the soil to be quite inconveniently fertile, and presents a grave difficulty to those who mine for minerals at a depth of more than a couple of fathoms from the surface.

All green things grow with an inconceivable rapidity. When a clearing where the land is under plough has been abandoned, only two short years are needed for it to relapse into jungle 10 feet high, and so thick and tangled that a way is only to be forced through it by means of an axe or wood-knife. At this stage the young jungle is called *cherung ber-luki*, or wedged underwood, by the Malays, and it justifies its name by speedily giving birth to new and younger growths, which in ten years transform the barren clearing into wild jungle, which is hardly to be distinguished from the very ancient virgin forest. As may be imagined, the task of weeding and cleaning crops of tea and coffee is not the lightest portion of a planter's work.

The excessive damp of the forests does not only serve to foster the vegetable growths; thousands of small green and brown leeches are bred in the dank leaves underfoot, and these worm their way through garments of all but the closest texture, and give a considerable amount of inconvenience to travellers through Malayan jungles.

In spite of the quantities of water, however, swamp-land is not a very common feature of the Peninsula. Almost all the rice-swamps are irrigated by artificial means; there are no lakes from one end of the country to the other, and even the ponds are by no means numerous. The waters of the Peninsula are almost always in motion, for stagnant water is soon licked up by the fierce sun-rays, and returns to earth and finds its way back into one of the thousand streams that water the land.

Travelling in such a country as I have described is not always easy. The Malay hates unnecessary toil, and walking in the tropics is rightly regarded by him as a weariness of the flesh. Therefore the rivers are the highways of uncivilized Malaya. In the lower reaches, huge boats, whose occupants are shielded from the sun by thick palm-mat roofs, are poled and punted up-stream until the river narrows. Then the big boats are exchanged for small dug-outs, which in their turn are used until the shallow waters become quite unnavigable. Even then the Malay traveller does not wholly desert the river, for in the jungle it is the

only real landmark and guide. The paths lead up the river-banks, crossing the stream frequently, until the hills which form its watershed are reached. Then the ascent is made, and the traveller passes down into the basin of another stream, which is followed in the same way until it too becomes navigable.

Such, then, is a rough description of the country through which I was called upon to lead my expedition in the spring of last year. While I was still upon the Pahang side of the hills which divide the Pahang river-basin from that of the rivers of Trengganu and Kelantan, matters were fairly easy. The members of this expedition assembled at the point of juncture of the Tembeling and Jelai—two streams which form the magnificent river from which the state of Pahang takes its name. My party consisted of Mr. R. W. Duff, the Superintendent of the Pahang Police Force, forty Dyaks, eight Sikhs, and an irregular force of two hundred and fifty Pahang Malays. Dr. A. B. Jesser Coope, Residency Surgeon of Pahang, also accompanied the expedition as medical officer. From Kuala Tembeling the expedition moved up the river of that name in a number of small boats, propelled by punting-poles, and three days and a half found us at Kuala Sat. The third day was spent in passing up the lower Tembeling rapids, which are fourteen in number. These rapids are formed by the sudden narrowing of the river-bed, which at this point measures in many places only some 20 yards or so across. The bed is exceedingly rocky, and the falls are numerous and very close together. The Malays, however, are extraordinarily expert boatmen, and the boats were towed and propelled, hauled and pushed up the rapids without mishap. At Kuala Sat the larger boats were abandoned, the members of the expedition being distributed among some forty dug-outs. A short distance above Kuala Sat the Spia river falls into the Tembeling on its right bank, and our way now led up this stream. For three days we laboured up the bed of this river, struggling through successive flights of rapids, many of which necessitated the unloading of every boat before the passage could be attempted. As may be imagined, this made journeying a somewhat slow operation, though, owing to the skill displayed by the Malays and Dyaks, far greater distances were travelled in a day than would at first sight seem possible. At length Kuala Rek, the point whence a jungle track leads over the hills into Trengganu, was reached, and, the boats being abandoned, the really difficult part of the journey began.

The first point to be considered, when planning such an expedition, is the question of transport. While a river route can be followed this presents comparatively little difficulty, since the boats can carry large quantities of provisions, ammunition, and other impedimenta. When the boats are abandoned, and a march through the forest is begun, matters are not so easy. An average Malay cooly on a long march

can carry only about 5 *gantang* of rice, that is to say, a weight of about 35 lbs. This quantity, which is equivalent to five bushels, is sufficient to supply one full ration for twenty days. The cooly who carries this load will himself consume one-half of his pack of rice in ten days, leaving only ten full rations to be devoted to the common use. Thus every cooly who carries ammunition, or any load that is not rice, requires another cooly to carry his rations for ten days, and accordingly the bulk of a column which travels through Malayan jungles is determined by the numbers of its members who do not help to carry rice. It will therefore be seen that it was imperatively necessary to cut down the baggage of the expedition to the lowest possible point, and as a first step I required every member of my party to content himself with a rice diet. The bulk of those who formed the expedition—that is to say, the Malays and Dyaks—were accustomed to regard rice as their staple, and therefore it was no hardship to them to live upon the diet supplied. The Europeans and Sikhs, however, were not accustomed to live upon rice, and the effect of the diet upon them was soon only too apparent. During an earlier period of my service I had lived for nearly two years in the then independent native state of Pahang, and circumstances had led me to content myself with the food eaten by the natives. I was accordingly well used to it, and am inclined to think that when a European has trained himself to live upon rice, he is healthier in the tropics than when living on the food which life in Europe has taught him to require. When accustomed to the diet, a large quantity of rice can be consumed without difficulty, and this is the only thing necessary to render a meal of rice sufficiently sustaining. To people who are unaccustomed to it, it is a physical impossibility to consume a quantity sufficient for health. To use the common expression, rice is “filling at the price,” and while hunger still remains unappeased, the want of the necessary stomachic capacity renders it impossible to continue the much-needed meal. As I have already said, I cannot personally claim any of your sympathy on this head, but my companions on this expedition suffered very great hardships for want of sufficient food. Day after day they would sit before their plates of dry, unpalatable rice, unable to finish the ration supplied to them, but with the pangs of hunger still unappeased. Those who have never experienced it can with difficulty realize the suffering that they were called upon to undergo, but to their credit be it said that, though they lost flesh and strength, they never allowed their energy to be diminished by all that they had to endure. I remember that soon the river fish, which we obtained by exploding charges of dynamite in the deep water-pools, began to nauseate them also, and that while we still travelled through the uninhabited jungles of upper Trengganu, we encouraged ourselves by dreams of the buffalo beef that we would feast upon when the first villages were reached. When we got to Malaka—the first village on

the Trengganu—the longed-for buffalo was killed too late at night for the evening meal, and the next day the raft which we had converted into a butchers' shop capsized, and all the meat was lost in a rapid. The feelings of one who has sustained the most crushing blow to his worldly prosperity could hardly have equalled the sensation of irreparable loss which we experienced on this occasion.

When our packs were loaded up the bearers numbered 147, the greater portion of whom were employed in carrying rice. In addition to this, the Dyaks and Malays who carried guns and their own ammunition also bore a supply of rice sufficient for eight days. The baggage of the European members of the force was as slender as possible, only three coolies being allotted to each white man. The travelling-mat and pillows formed one load, a despatch-box a second, and a small quantity of clothes made up the third load.

A description of the march from Kuala Rek across the hills to the banks of the Trengganu river, will serve as an example of what all our land marches were. At 4 a.m. the camp was roused, rice cooked, and as large a meal as possible eaten. We all fed much as one stokes an engine, for we knew that we should not see food again for twelve hours, and though in the early morning before the dawn one has naturally little appetite for food, this knowledge forced us to fill ourselves up with rice in spite of all physical disinclination. At 6 a.m., the bearers being loaded up, the march was begun. The Dyaks marched first, then the Europeans, next the armed Malays, then the baggage coolies, and then, lastly, the rear-guard of Malays, Dyaks, and Sikhs. The path we followed was so narrow that we could only move in single file, and the column, when on the march, thus straggled over some 300 or 400 yards of country. The grey mists of the morning were still hanging heavily around us as we broke camp, and here up among the hills the air was intensely chilly. The thermometer probably registered some 60°, but in the tropics, when one is clothed in thin garments, and not too many of them, anything below 70° seems unpleasantly cold. The grass and the leaves of the jungle through which we passed were saturated with the heavy dews which had fallen during the night, and we were all soaked to the skin before we had travelled a quarter of a mile. Our way led up the banks of the Rek, a small stream which falls into the Spia at Kuala Rek, and in the first half-mile we waded across this river nine times, the water being up to the middle of our thighs. At length we reached the point where the Kenering river falls into the Rek on its left bank, and we then began to wade up the bed of this stream. The water was only up to our ankles, but, coming direct from the hills, it was intensely cold, and the large stones which formed its bed bruised our feet, and rendered marching a very painful operation. By the jungle-bred Malay and by the Sakai, who are the aboriginal natives of the peninsula, streams such as these are looked upon as

Nature's macadamized roads—natural tracts through the jungle where no knife is needed to force a way. To the European, however, walking up such a stream is very heavy work. Boots and socks speedily become filled with water, which gives one much the same sensation as though one was struggling through a ploughed field. Every now and then we encountered a number of large boulders or a fallen tree, over which our long file of men scrambled as best they could. Progress was slow, and we probably did not average a speed of more than a mile and a half an hour. For five mortal hours we waded up the bed of this interminable river, slipping, splashing, and plodding along until our guides told us we had reached the point whence we were to leave the Pahang river-basin, and to strike out across the mountains for the valley of the Trengganu in Trengganu territory. Here we halted for all our stragglers to collect, and to give the men a rest before we breasted the hills.



CAPITAL OF TRENGGANU.

Then, after an hour's halt, we formed up again, and began to ascend the hill. The height of this mountain we estimated at 2000 feet above the level of the plain, and the path we followed led up it in a series of pitches, of about 500 feet each, in which the grade was about one in two. At the top of each of these stiff climbs, the path ran along a small hog's back or spur, until the foot of the next ascent was reached, and then, after about two hours' steady climbing, we gained the summit of the range. The large jungle which I have already described grew as thickly up to the very crest of the mountains as it did down in the plain, but the undergrowth was not so thick, and in many places it was possible to see for 40 or 50 yards around us. The canopy formed by the interlaced branches overhead, however, protected us effectually from the fierce rays of the sun, and our clothes still hung wet on our bodies when we mounted into the cold air on the mountain-top. Here another halt was called, and nearly an hour elapsed before our bearers were fit to tackle the descent. This on the Trengganu side is somewhat steeper and shorter than on that up which we had climbed, and in

places it was so abrupt that we were forced to swing ourselves down from the roots of the trees which grew on the hillside. As soon as we had reached the valley we halted for the night, and here again a description of our camp will serve to give an idea of what all our camps were like as we journeyed through the forest.

When the halt is called, all the loads are grounded, and the sentries are placed round the spot selected for the camp. Then all the Malays and Dyaks who are armed pile their rifles, and join the bearers in building the huts. The place chosen is always on the banks of a small stream, and at a spot where some of the many wild palms grow in abundance. Each hut is formed of a couple of forked uprights driven into the earth, and another pole laid across and rested horizontally upon them, at a height of about 4 feet from the ground. Palm fronds are then rested against this cross-piece so that the ends of the fronds hang over, and thus form at once a back wall and roof to the hut. Each shed will hold about four men and their loads, but the Europeans and the chiefs are lodged in huts which are somewhat more elaborately constructed. The palm-leaves are woven into a mat about 8 feet long by 5 wide, and this mat is rested slantwise against the wooden cross-piece.

The back wall and roof thus devised are, comparatively speaking, waterproof, and one may pass even a rainy night in one of these shelters without any very great discomfort. It is extraordinary how quickly such a camp can be constructed, and in half an hour a sufficient number of sheds can be erected to afford shelter for three hundred men. Beds of boughs and leaves, soft and springy, and fragrant with the fragrance of the forest, are made inside each shed, and on these the mats are laid. Soon camp-fires are burning brightly in the gathering dusk, and the smell of the wood smoke and the boiling rice fills the air. The latter is a scent which is by no means unwelcome to the nostrils of men who have marched all day, and who have not tasted food for twelve hours. After a bath in the stream, and a change into the light sleeping-kit affected by Europeans in the East, the white men lie down on their mats side by side, talk or read as the fancy takes them, "blow the cool tobacco cloud and watch the white wreaths pass," and long for the food to be ready. Then comes the much-needed meal, then another lazy hour, and then the fires die out one by one, and the camp sinks into slumber. As one lies resting through the long hours of the night, if one chances to wake, sounds are brought to one's ears that tell that the jungle is afoot. The argus pheasants yell to one another through the forest, the far-away trumpet of an elephant breaks the stillness, and the frightened barking cry of a deer is borne to you from across the river. The insects are awake all night, buzzing, chirping, and singing to one another from the trees and from the ground; and the little workman bird sits in a branch close by you and drives coffin-nails

without number. Then at 4 a.m. the sentries arouse the camp, food is cooked, morning ablutions performed, and we scramble into our imperfectly dried clothes to begin the labours of another day, which closely resembles that which I have already described.

In two or three days we made our way through the jungle in this manner, till at length the Trengganu river was struck at a point where it was navigable. This country abounds in big game, and the tracks made by the animals going down to water were in many places 6 feet wide, and as beaten as a bridle-path. The district was still wholly uninhabited, and we had to construct our own rafts before we could make use of the river. For this purpose we felled about four hundred of the largest bamboos we could find, and therewith constructed fifty rafts capable of carrying two hundred men and all our baggage. About a hundred of our bearers were sent back to Pahang as soon as the rafts were completed, and by the afternoon of the day on which we began to fell the bamboos all was ready, and a start was made.

The bamboo is a marvellously useful plant. The Malays utilize it for every conceivable purpose. I have seen houses the whole of which, including walls, thatch, and internal fittings, were constructed of some portion of the bamboo. Candlesticks for use up-country are made of it, baskets, fish-traps, fences, cups, cooking-pots, pickle-jars, and a hundred other things, are all fashioned from bamboos by the up-country Malays. In Trengganu, below the Kelewang falls—the large rapids, which cut the country in twain, and down which nothing can be brought—bamboos are planted and grown, and sell at a ruling price of five cents each, so necessary is the bamboo to the comfort of all Malays. There is no purpose for which this plant is more useful, however, than that of the traveller who desires to make use of the rivers which abound in uninhabited parts of the Peninsula. Near the foothills, in the centre of the Peninsula, the country is one large bamboo brake, and as eight or ten large bamboos will form a raft capable of carrying five men and their baggage, a means of transport is easily found for travellers in these portions of the country. The bamboos are bound closely to one another by pieces of rattan, which grow luxuriantly in all Malay forests, and only require to be cut and split. Four Malays will construct a raft, with a platform in the centre for the reception of baggage or passengers, in about half an hour from the time when the first bamboo is felled.

When the rafts are ready and loaded up, they are pushed out into mid-stream, a Malay standing at the bow, and another at the stern, each being armed with a long straight pole cut in the jungle. Then begins the fun. The rivers run through beds now deep and comparatively sluggish for a few yards, then shallow and very rapid as the water rushes over a couple of hundred yards of shingle, then down a succession of falls, where the river-bed is studded with boulders

and rocks, by striking any of which a raft may come most utterly to grief. When a very large rapid is encountered, the baggage is landed and carried overland to the foot of the fall, while the rafts are taken down light and cargo-free. The river is usually deep at the head of the fall, and a great combing wave of perfectly smooth and oily water marks the spot where the rapid begins. The raft is borne steadily, and with a gliding motion, along this wave, until the crest is reached, and then with a lurch and a rush it is whirled down into the fighting, roaring, tearing waters of the rapid. The water breaks over the knees and sometimes over the chest of the poler in the bows. The raft wallows deep, and rolls like a liner in the trough of a monsoon-beaten sea, and only practice enables one to keep one's footing on the slippery bamboos, and at the same time to guide the raft by means of timely punts at the surrounding rocks with the pole with which one is armed. In one rapid which I shot, the foam of the troubled waters rose so high that the spray broke continuously in a white sheet far above my head, but it is only spray, and one experiences no difficulty in drawing breath. Also, it must be remembered that rapid shooting is not so dangerous as it looks, or as one would be inclined to fancy from this description. The raft is going *with* the rush of the water, and not against it, and the waters do not usually dash a raft against the rocks, as there is always a strong offset from them formed by the water, which, having met with resistance, is thrown violently back upon itself. None the less, many upsets, and one or two accidents of a more or less serious character, occurred before the last rapids were passed. One day we got too far ahead of our food-supply, and darkness fell before the rafts carrying it had come into camp. Those in charge of the rice were aware that I and the advance party would be forced to go supperless to bed, unless an effort were made to bring us a ration of food, and three young Malays, the eldest being only some eighteen years of age, volunteered to attempt the descent of the three formidable rapids which divided their camp from mine. It was a pitch-dark night, and an upset meant death; but that, they said, was not worthy of consideration, seeing their leaders stood in need of food. The night was very still, and I and my European and Malay companions, who formed the advance party, had stretched ourselves on our mats, trying to forget our hunger in sleep, when suddenly we were all startled by the chorus of shrill yells up-stream, which told us that a party of Malays were trying to make their way down to us through the rapids. We all sat up and listened, for we well knew the danger of the attempt, and the yells which echoed and re-echoed through the forest told us how it was faring with our comrades, and, be it added, with our dinners. The whoops and yells from the youngsters' voices rang out bravely, till suddenly they were checked with a jerk, and for a moment we thought the raft had been upset. They had indeed struck a rock, but in a few

moments the shouts broke out afresh, and after a further interval of keen suspense, the raft was tied up alongside my own, and the cooking-fires arose all over the sandbank on which we had encamped. This is a good instance of the devotion which the Malays so often show to those who are their leaders.

In June I had to pass down this same flight of rapids by night, with a party of fifty men, as we were at that time hot-foot in the trail of a party of *dakults*, and everything depended on speed. There was a moon that night, however, so the danger was not so great; but I know of nothing so trying to the nerves as a passage down large rapids in semi-darkness.

During the course of the expedition we traversed all the country which is situated between the Trengganu and Kelantan rivers, and we mapped out all the districts through which we travelled. I regret that I have not, at the present time, a copy of the large and detailed map which was made from our surveys. I hope, however, to be allowed, at no very distant date, to present to the Society a copy of this map, which gives far more clearly than any description can do those details as to the physical formation of the country which are most interesting to students of geography.

TRENGGANU.

The state of Trengganu comprises within its borders the basins of no less than twelve distinct rivers, all of which fall into the China Sea. The largest of these rivers is the Trengganu, from which the state takes its name; but the Kemaman, Dungun, Stiu, and Besut rivers are all streams of a respectable size, which compare favourably with the Rompin and Kuantan rivers in Pahang.

In the interior of Trengganu, three streams, the Trenggan, the Kerbat, and the upper Trengganu river, flow together and form the Trengganu river proper. The country through which these streams flow is exceedingly rocky, and the river-beds are consequently much obstructed by rapids. The great Kelemang falls, the impassable rapids which cut the country in twain, and which have so greatly retarded the progress of the State, are situated at a distance of only some 40 or 50 miles from the mouth of the river. The large tracts of country above these rapids are inhabited by only some three or four hundred souls, the whole bulk of the population being crushed into the districts which lie before the falls and the mouth of the river. This portion of the valley of the Trengganu river is singularly open, containing more grass and plough land than I remember to have seen in any other part of the Peninsula. It is for the most part flat, though the hills which enclose the plain can be seen in the distance on either side of the valley. On nearing the mouth of the river, however, the prevailing flatness of the coast country is broken by a number of low conical hills of a rocky nature.

The other coast rivers in Trengganu territory from Kemaman to Ibai are all inhabited, and tin is found in payable quantities in several of them. A European company is now engaged in working a lode at Bandi, in Kemaman, but little else of an effective nature has been done towards developing the mineral resources of this state. The country in the interior of Trengganu is for the most part of a granite formation, and tin is known to exist in many places; but here, again, no steps have been taken to develop the stanniferous deposits.

The Stin river, which has its source in the Gunong Chaping mountains, which also give rise to the Besut, runs thence to Kuala Permaisari through forest country which is not very thickly populated. At this point it suddenly widens out, and for the rest of its course it is strewn with islands, and extends to right and left in numerous creeks and *culs de sac*. For a considerable distance, before the mouth is reached, the river runs parallel to the sea, and within sight of it, being only separated from it by a sandpit. This river is very deep, and is infested with crocodiles—a very unusual thing on the east coast of the Peninsula. It is said that these reptiles annually devour many people; and that they are much dreaded is evident from the precautions taken against them, the bathing-houses being enclosed by strong fences, and in the case of boats the decking being laid along the bottom, and not flush with the sides, as is the usual Malay custom. It is said that even then it is no uncommon thing for a boat to be attacked and capsized by the crocodiles on this river.

The Besut river, which is thickly populated from Kuala Kambia to the mouth, is chiefly remarkable from the fact that the havoc wrought by the typhoon which devastated this district and the neighbouring country in Kelantan in 1881 is still plainly visible. I am informed by Mr. Duff and Mr. Jesser-Coope that for a distance of several miles from the coast the country is bare of the thick forest which forms the principal unvarying feature of all uncultivated land in the Peninsula. On some of the hills near the coast not a single tree was left standing, and the immense quantity of drying timber thus left lying under a tropical sun was not long in generating fire, which quickly spread in every direction, and in its turn did almost as much damage as had been done by the typhoon. To this day the people of Kelantan, Besut, and many other parts of the east coast, date everything from the year of the "Great Wind."

Until Mr. Duff and Mr. Jesser-Coope led their parties into the Stin and Besut rivers in May, 1895, neither of these districts had ever been visited or explored by a European.

When the present sultan succeeded in 1881, being at the time a mere boy, his numerous relations recognized that an opportunity, which they had long desired, had at length arrived. Under the iron rule of his great-uncle Baginda Umar, and while his father Ahmad was still

alive, the revenue of the state went to fill the royal coffers only, and the rajahs and chiefs of the country were mainly dependent on the sultan's bounty for their supplies. In Zenal-a-Bidin III., however, they found a weak, studious boy, afflicted with a slight impediment in his speech, which made him shy and nervous in their presence, and whose devotion to his religious studies and practices caused him to be easily influenced by his pastors and governors. The strong rule to which Trengganu had become accustomed during the reigns of Umar and Ahmad had now given place to a weak form of government of which a boy, who possessed no personal authority in the state, was the nominal head. Clearly his relations could exact what terms from him



PAHANG RIVER.

they pleased, and he would be powerless to resist them, and would hardly know that what they advised or demanded called for opposition on his part. Accordingly, in 1882 and the following years a partition of the revenue of the state was arranged, and when all received their share, Sultan Zenal-a-Bidin III. was left with only the Trengganu river from Kuala Telemong to the mouth, and the small adjacent river of Ibai, from which to derive his revenue. Even then many were found to express discontent because a share of the spoils had not been allotted to them.

The foregoing paragraph must not be misunderstood to mean that the sultan in any way relinquished his authority and jurisdiction over the districts mentioned. The partition to which I referred related

solely to the revenue of the state; though, practically, the collection of revenue, under Malay rule, being the principal function of government, a great deal of power inevitably finds its way into the hands of the person who has the right to levy the taxes.

In the reigns preceding that of Baginda Umar a feudal system, as complete in its way as any recorded in the history of the Middle Ages, was in force in Trengganu. This system, which presents a curious parallel to that of Mediæval Europe, is to be traced in the form of government of every Malay kingdom in the Peninsula with which I am acquainted, and it was to be found in full force in Pahang when that state was protected by the British Government in 1888. In Trengganu it has undergone considerable modification, and has now been replaced by a wholly different form of government. Under the Malay feudal system the country is divided into a number of districts, each of which is held in fief from the sultan by a *dato'* or district chief. These districts are subdivided into minor baronies, each of which is held by a *dato' muda*, or chief of secondary importance, on a similar tenure from the district chief. The villages of which these subdistricts are composed are held in a like manner by the *ka-tua-an*, or headmen from the *dato' muda*. In the event of war, the sultan calls upon the district chiefs to render the military service which they are bound to afford, and each chief summons the *dato' muda*, who call the village headmen, who bring with them the able-bodied *raayat* who dwell in their villages. In the same way the sultan often levies money from a district through the agency of a local chief, who, in common with the headmen under him, takes care that the whole burden shall be borne by the *raayat*. The latter may be said to have practically no rights, whether of person or property, under this system. Not only does he pay all the taxes and exactions which the raja, the district chief, or more immediate headmen may exact; not only is he called upon to labour continuously that others may profit by his toil; not only is he required to perform any work that may be demanded of him by his superiors without recompense or reward; but the fruits of his labours, all the property of which he stands possessed, and the very persons of his womenfolk only remain his so long as he is strong enough to resist the person by whom they are coveted.

Baginda Umar and his successor Ahmad would appear to have resolved to allow the feudal system to die out in Trengganu, and in pursuance of this policy they declined to appoint successors to most of the chiefs and district headmen who died during their reigns. With the exception of the Orang Kaya Duyong and the Orang Kaya Stiui, there are now no commoners in Trengganu who still possess territorial rights within the state, and even these two men do not occupy a position such as formerly belonged to the great feudal chiefs.

Instead of the great chiefs the country has been divided up into a

number of village communes, the *peng-hulu* or headman of which is directly responsible to the sultan. The present system of government in force in Trengganu may therefore be described as one of centralization.

In Trengganu proper, and in most other thickly populated portions of the state, each village is managed by its own *peng-hulu*, villages situated in close proximity one to the other being wholly disconnected in so far as their administration is concerned.

The relations of the raja, to whom one or more districts in the state have been granted as a source of income, are for the most part absentee, the work of collecting the revenue from their people being entrusted to agents. These men, who are usually natives of Kuala Trengganu, being practically unchecked, tyrannize over the local headmen and the people of the out-districts, secure in the knowledge that none dare raise voice in complaint, and that no ill thing is likely to befall them provided that the district continues to be a steady source of income to the raja to whom it has been granted. The *Budak Raja*, or youths who form the immediate *entourage* of the royal family, from whom these men are recruited, are as a class famous in all Malay states for their arrogance and overbearing conduct to the people. A somewhat coarse vernacular proverb, current among the Malays, lays emphasis upon the fact that the pupile will outdo their master if he sets them bad example of no matter how trifling a nature, and the truth of the saying is exemplified by the *Budak raja*, who do more than is ever done by their principals towards oppressing and grinding the faces of the people. Such, then, are the men who in Trengganu have replaced the district chiefs of former years, and the change is certainly for the worse. The hereditary chief of a district in Malay countries is usually related more or less closely by ties of blood with the people over whom he rules. He has been born and bred among them, has wed their womenfolk, lived their lives, shared in their troubles and their good fortune, more especially the latter, and even at his worst knows and is known most intimately by them, and cannot but be largely in sympathy with them. The *Budak Raja*, however, looks upon the capital as his home, and sojourn in an out-district as banishment. He is not of the blood of the people over whom he rules, he does not know their affairs, despises their ways, is too arrogant to make himself acquainted with their feelings or their thoughts, is utterly out of sympathy with them, and merely regards them as a potential source of revenue, missing no opportunity of enriching himself at their expense.

It is difficult to exaggerate the evils attending this system of absenteeism, and the consequent appointment of agents. With the exception of Dungun and Besut, and to a lesser extent of Kemaman and Stiu, none of the districts granted by the Sultan to his relations are the places of residence of the rajahs or chiefs to whom they have been bequeathed. Even in places where a raja is in charge, either on behalf of himself or

as the agent of the real grantee, the result is still unsatisfactory. Taken as a class, the Malay raja is not a person who is much enamoured with abstract justice, and in the cases above cited the resident prince is almost as much an alien, in the eyes of the people of the district, as any other native of Kuala Trengganu would be whom he might appoint to act as his agent. He also looks upon the people of the district over whom he rules simply and solely as a source of revenue, and the love of money effectually allays any feeling of compassion which might otherwise be excited in him by a knowledge of their necessities. Tungku Besar—who bears a better reputation for kindness than does any other raja in Trengganu—somewhat cynically shows the point of view from which he regards the people of his district, and the conception he has formed of his responsibilities towards them, by the fact that Marang is farmed by him to a Chinaman.

Another evil arising from the division of the country into several districts, from each of which some relative of the sultan has to provide himself with an income, is that, as might be anticipated, the people throughout the state are taxed until the limit of the possible has been reached. The principal exactions are as follows:—

Banchi or Poll-tax.—Once in three years a tax of \$1 per head is imposed on every circumcised male throughout the state by order of the sultan. This tax is levied in order to defray the expenses consequent upon sending the *bunga amas*, or triennial state present, to Siam. The *rajas* in charge of the various districts also impose a tax of one *amas* or fifty cents, sometimes annually, sometimes triennially; but this is usually regarded as a laborious manner of collecting a revenue which can more easily be obtained by other means, since custom precludes a larger poll-tax than one *amas* being levied by any one but the sultan.

Seruk.—This is a very well-known manner of obtaining revenue, and is as much valued by the taxing classes as it is abominated by those upon whom devolves the duty of paying taxes. It is managed in one of two ways. Either a consignment of goods is sent to the village or to an individual, and a price considerably in excess of that current in the markets demanded in return for them, or else a small sum of money is sent, and a message conveyed to the recipients informing them that a given quantity of *getah* or jungle produce is demanded in return. On the receipt of a *seruk*, a village headman calls his people together and enforces a public subscription to meet the sum required by the *raja*. The goods are then divided among the subscribers, but as the quantity of goods is altogether out of all keeping with the high price paid for them, and as the village elders usually insist on receiving the full value of their subscription, the weaker members of the community get little or nothing in return for their money. Money *seruk*, in return for which jungle produce is to be supplied, is generally made to an individual, who has forthwith to betake himself to the jungle,

there to seek for the required commodity until a sufficient quantity has been obtained. Meanwhile the cultivation of his land, and all the labour on which he and his family depend for their livelihood, has to be neglected until the *raja's* demands have been satisfied. Nor are his ills then at an end, for if he has successfully performed one behest, he is very likely to at once become the victim of another *serah*.

Krak.—This is not a tax in the strict sense of the word, being the system of *corvée* which is in force in every unprotected state in the



A RAPID.

Peninsula. As it is employed in Trengganu, however, it is an engine by which revenue is raised, and must find a place in any account of the system of taxation to which the people of this state are subjected. The people of Dungun and other parts of the country from which good timber is exported, are called upon annually to fell a certain number of trees, to square the logs, and to float them to the mouth of the river ready for transmission to China or the Straits. For this they receive no remuneration of any kind, the timber all being regarded as the

property of the district *raja*, who even goes so far as to enforce payment from the people for the tools supplied in order to enable them to perform this work. Owing to the impassable nature of the Kelemang falls, the people living above the rapids in Ulu Trengganu are not required to work timber for the district *raja*, but they have to supply large quantities of jungle produce on terms which are very similar to those on which timber is worked by natives of other parts of the country.

All jungle produce, such as *getah*, camphor, agilar wood, rattans, etc., are recognized throughout the state as being the property of the various district *rajass*; and all such articles have to be brought to head-quarters, and sold to the *raja* or his agents at the price determined by them. Thus *getah*, which is the most valuable product yielded in any great quantities by Malay jungles, has to be sold by the people at \$25 per *pikul* if of inferior quality, and at \$50 per *pikul* if of the best kind. The prices now ruling in the interior of Pahang are \$50 per *pikul* and \$150 per *pikul* respectively, for inferior and superior *getah*. Camphor is valued at \$20, \$25, and \$30 a *kati* according to quality, as against \$60, \$70, and \$80 in Pahang. Gambir is sold by the basket of 5000 pieces, the price paid being 10 *kupang* in Trengganu currency, viz. \$2.50. In Pahang \$5 is the lowest price paid for 1000 pieces. Damar is also exported in considerable quantities from Trengganu, and this also has to be sold to the district *raja* at a uniformly low price. Kamuning wood, gum-benzoin, and ivory are similar perquisites.

The monopoly laws with regard to jungle produce, unjust and oppressive though they are, indirectly benefit the state, since they act as a protective measure, the natives not being tempted to the wholesale destruction of *getah*-producing trees when they are aware that their share in the profits accruing from their labours will be but small. The law regarding gambir, however, is wholly opposed to the best interests of the country, since owners of plantations are reluctant to persevere with their cultivation whilst the profits derived by them from their produce are so small. In Dungun of late years many gambir gardens have been abandoned, and it has been found necessary to punish the owners with fine in order to induce them to resume possession of their plantations.

In Ulu Trengganu, and in other parts of the state, owners of buffaloes are not permitted to sell their cattle for export except to the district *raja*, who purchases them at \$8 to \$12 per head, and annually exports a considerable number to places where the ruling price is double or even treble these sums. Any infringement of the *raja*'s rights is punished with a heavy fine, and in such awe do the people stand of their chiefs, and so law-abiding and docile are the agricultural classes of Malays, that I am assured on all hands that cases of infringement are very rare.

In the coast districts the principal source of revenue is derived from an export duty of \$1 per *pikul* imposed on fish, large quantities of which

are exported annually to Singapore. The right to collect this duty is generally farmed to one of the local Chinamen. The average cost of fish per *pikul* is \$3.25. The duty, the freight to Singapore, the cost of transport, etc., amount to \$1.50 more, making a total cost of \$4.75 per *pikul*, which, as the ruling price in Singapore is \$5 per *pikul*, leaves a margin of 25 cents per *pikul* to the shippers. The fishing industry, including the curing and drying of fish, is entirely in the hands of the Malays, all the shipping being done by the Chinese traders who live at the ports along the coast, the majority of whom have been born and bred in the state.

The revenue obtained from the duty imposed on all opium imported into the country is very trifling, not exceeding \$5000 per annum, and the gambling farms yield even more slender revenue, only Chinese being permitted to gamble, though a considerable amount of surreptitious gaming is carried on, from which the state derives no revenue, and upon which no efficient check is imposed.

Tobacco is not a monopoly, as was formerly the case in Pahang, but salt is only imported by the rajas, who, however, retail it to the people at fairly moderate prices. All other imports are subject to a duty of 10 per cent., payable in kind or in value at the option of the raja in charge of the coast district into which the produce is imported.

The Sultan's own share in the revenue of the country is derived mainly from the duty levied on fish exported from Kuala Trengganu, from the duty on the imports which enter that port, from harbour dues—\$20.70 being exacted from each ship which enters the river, and smaller sums from junks and native crafts—from the sums paid on account of the fines by means of which offenders are usually punished, and, lastly, from the coining of tin tokens.

I have referred to the fines inflicted by the courts as being one source from which the sultan's revenue is derived. The raja, like his great-uncle, the baginda, does not personally administer the law to his people, and the rude justice which was dispensed in former reigns has now been replaced by a system under which the length of the litigant's purse forms his best claim to a hearing.

From the Malay point of view, the administration of justice is regarded by the rulers of the state as a leading and legitimate source of revenue. The *pen-buah balui*, or fees of court—literally the money paid for cleansing the state hall after the hearing of a case has soiled it—yield one portion of this revenue, and the other and larger portion is derived from the fines which are inflicted as punishment for almost every offence. The Sultan himself I believe to be a just man, and this view, I found, is shared even by men who had obtained but scanty justice in the Trengganu courts. He remains for the most part unaware of the things which are done in his name by the men to whom he has delegated his power, since they take infinite care that he should

not be surrounded by any but their own creatures. People who wish to make personal representations to him find their ways hedged round with many difficulties; and even if these have been surmounted, they invariably find themselves obliged to formulate their complaints in the presence of the powerful chiefs by whom the wrong has been done, and who have only to assure the Sultan that the petition is frivolous to ensure the instant dismissal of the petitioner. After this the man who has forced his way into the royal presence against the wish of those by whom the Sultan is controlled and guided, soon discovers that, so long as he continues to reside in Trengganu, his lines are not cast in pleasant places, and others, seeing this, are not encouraged to follow his example.

In all civil cases one half of the debt recovered is claimed by the court, and is, for the most part, divided among the presiding judges, only a small percentage finding its way into the Sultan's coffers. This is now generally recognized as the unauthorized but understood custom of the land, and I am assured by the leading Chinese traders of Kuala Trengganu that, as a consequence, they have long ceased to take their cases for settlement into the Sultan's courts. Accordingly, no credit is given to the local Malays, and to any one who is acquainted with the system upon which trade in a native state is conducted by the Chinese, this implies that from the outset it is very seriously hampered and impeded.

Theoretically, all criminal cases are tried according to *Hukum Shari*—Muhammadan law—but many of the more severe penalties enacted by that code are now commuted to fine or, in default of payment, to imprisonment. Murder, as in other Muhammadan countries, is punished by the payment of *diat*, or blood-money, unless the relatives of the deceased insist on a life for a life. This *diat* is fixed at \$1200, and as the Trengganu bench usually claims half or more than half of this sum, the chiefs who administer the law generally take steps to ensure the acceptance of blood-money by the relations of the murdered man. Hurt or grievous hurt is for the most part punished by the payment of *pampas*, or fine for bodily injury, which is supposed to be paid to the person hurt or wounded. Unless, however, he is a man of sufficiently strong position to enforce the payment, the money usually remains in the hands of the chiefs by whose orders it has been paid. Theft, which by the *Hukum Shari* is punishable with *kudong*, or mutilation of the hand, in Trengganu, is now generally punished by fine. Almost all other offences are treated in like manner, the fines inflicted being more usually fixed by the reputed wealth of the offender than proportioned to the magnitude of the offence. Indeed, a reputation for affluence is in itself a source of danger, since it not infrequently causes its possessor to be mulcted in large sums for purely imaginary crimes, which it is alleged that he or one of his relations has committed.

Thus, though money can buy immunity from punishment under all circumstances, its mere possession is often sufficient to call down retribution on the heads of perfectly innocent people.

Nothing in the nature of sifting evidence is attempted. Men are frequently punished without having had any opportunity of defending themselves, and without any adequate proof of their guilt, beyond a bare *ex parte* statement having been placed before the court. The whole system is hopelessly corrupt, the courts merely existing as an engine by means of which revenue can be squeezed from the people, and the injustice daily done in the name of the pious Sultan Zenal-Bidin of Trengganu is at least as crying as that which was formerly



ABOVE THE CLOUDS.

perpetrated by the orders of the frankly irreligious Sultan Ahmad of Pahang.

According to the theory by which Trengganu is governed, all offences committed in the state are supposed to be tried at the capital, but, as a matter of fact, a considerable amount of power is usurped by the district rajas and their agents, who freely fine their people, and only send offenders with whom they find themselves unable to deal to the Sultan's courts for punishment. The local authority of these chiefs and their agents is so great, and in such awe are they held by the people whom they rule and oppress, that there is practically no appeal from their decisions, no one being found sufficiently daring to incur their displeasure by hazarding a petition to the Sultan, which would in all probability prove abortive or unsuccessful. Thus, from end to

end of the state, the people are given over to injustice on which there is no check, and to which there is no limit, save such as may be imposed upon their rulers by the compassion which the condition of their subjects may be supposed to excite. When both the governors and those they rule are Orientals, this is but a sorry reed on which to lean.

When fines or debts to the state cannot be paid, the persons from whom they are due are placed in the *pen-jara*, or gaol, until such time as the required payments have been made by their relations, or by others who desire to purchase them as slaves. On April 22 I paid a visit to the *pen-jara* at Kuala Trengganu, and I shall never forget the impression made upon me by the shocking sight which it presented. It consists of an enclosure, built in the very centre of the *Kedai Tanjong*—one of the most crowded portions of the town—surrounding the cages in which the prisoners are confined. The fence is built of heavy slabs of wood some 3 inches thick, 2 feet broad, and 10 feet high, which are fitted together so as to form a solid wall. Inside this fence, and at a distance of 30 inches from it, are two rows of cages placed back to back, which are made of heavy bars of wood with intervals of a couple of inches or so in every eight for the admission of light and air. These cages are raised about 6 inches from the ground, and measure some 6 feet in length, 2 feet in width, and 5 feet in height. The cages are twenty in all, that is to say, ten in each row; and when I visited the *pen-jara* it was fairly full, in one instance two men being confined in the same cage. Prisoners once condemned to incarceration are not again released until the money for which they are detained has been paid by their relatives, or until death sets them free. When I say that they are not released, I mean that they are literally never permitted to leave the cages in which they have been placed. No sanitary arrangements of any kind are provided, no one ever cleans out the cages, and the space between the floor and the ground, and the interval which separates the cells from the surrounding fence, are therefore a seething mass of excrement and maggots. Owing to the heavy bars which form the sides of the cages, the close proximity of the prisoners to one another, and the solid wooden wall which shuts out all ventilation, the atmosphere inside must be something appalling, for even in the spaces between the cages and the fence—a comparatively airy spot—it is calculated to turn the strongest stomach. To add to their misery, no bathing appliances of any kind are supplied to the prisoners, and the filthy persons of the inmates beggar all description.

The *Pet-tunda*, or executioner, who is in charge of the *pen-jara*, receives no grant from the Sultan from which to defray the expenses of the prisoners, but he is entitled to levy one *gantang* of rice from every boat laden with grain which enters the river, and he is also allowed to collect a daily due of fish from all the local fishermen. Both

these sources of revenue are only available during the open season, since trading boats do not enter the river, and the fishing-smacks do not put out to sea, while the north-east monsoon is raging. This, however, does not affect the prisoners, for the *Per-landa*, being an Oriental official, and the rajas and chiefs who are responsible for the administration of the country concerning themselves not at all for the welfare of the inmates of the prison, it is hardly necessary to say that all the collections made by the executioner are appropriated to his own use, and that the prisoners only obtain such supplies as their relations may make shift to send them, and then only if a sufficient fee has purchased the consent of the *Per-landa*. In 1894 no less than three men in the



ON THE PERAN RIVER.

penjara died of starvation. This fact was casually mentioned to me by one or two natives of Trengganu, with whom I was discussing the local prison system, and in them it appeared to excite neither surprise nor any other particular emotion.

As though the punishment dealt out to the prisoners was not already sufficiently severe, several of them I noticed were heavily loaded with chains, one man especially so, having an iron collar round his neck, which was fastened by heavy links to rings round his ankles, and to chains passed about his waist.

Men, women, and children were alike inmates of the *penjara* when I visited the place, and all presented the same lamentable spectacle. The chalk-white faces blinking or staring at one through the heavy bars of the cages; hollow cadaverous cheeks, the paleness of which was only intensified by the blackness of the long, matted, vermin-infested

abooks of hair; eyes, receding deep into their sockets, and with the wild, hunted expression of some caged animal; sickness, misery, degradation, and disease; filth of person, and surroundings which baffled all description, went to make up as painful a picture as one would desire not to witness. The foul air, the overpowering stench, the lack of water for bathing purposes, and the insufficient diet kills many after a few months' confinement; and yet Orientals can support an amount of dirt and physical misery which would breed a pestilence among Europeans in an incredibly short time. Some prisoners, on the other hand, pass years in the cages, being fed by their relatives, and, though covered by scales and disease of every kind, they become at length, I am informed, absolutely callous and indifferent, expressing no longer any desire to regain their liberty.

Lunatics, as well as criminals, are confined in the *pen-jara*, and, since the imprisonment in these cages often breeds madness in sane persons, it is not to be wondered at that lunatics so treated never regain their reason.

Similar prisons are in existence, I am told, at Kuala Kemaman, Kuala Dungun, Kuala Stin, and Kuala Besut; but of these I cannot speak as an eye-witness, and I believe that their existence, though connived at, is not recognized by the central authorities in Trengganu. Any person occupying a high position in the state, however, can cause his or her personal followers to be confined in the *pen-jara* by the simple process of sending them to the *Per-tanda* with an order for admission—a kind of *lettre de cachet*—and without the tedious formality of a trial being considered necessary.

The population of the valley of the Trengganu river is about 45,000 souls, only 500 of whom inhabit the country above the Kelemang falls, the remaining 44,500 being crowded into the space between the falls and the sea. Of these, about 12,000 occupy the capital and the villages in the immediate neighbourhood. The country between the falls and the capital thus accommodates a population of about 33,000 souls, and is, therefore, one of the most thickly populated portions of the Peninsula. In most states, where the population is still chiefly composed of Malays, the villages are scattered, and are usually separated from one another by long stretches of forest; and even in Trengganu, this is the case so far as the nature of the country permits. The Malay prefers to have plenty of room. He perceives that a livelihood is earned by all with more ease and less labour and difficulty if people are not too thick upon the ground, and, in pursuance of this conviction, he plants his village, if he can do so, at a safe distance from those of his neighbours. The existence of the Kelemang falls, however, has restricted the natives of Trengganu in their choice of village sites, and, as the condition of those who dwell above the rapids has not encouraged others to follow their example, the greater portion of the population has elected to live below the falls; as

a consequence, they have to submit to what, from a Malay point of view, is rather unpleasant crowding. The result of this has been that the natives of this state have had to work harder in order to support life than is usual among Malays, and in course of successive generations this has led to the development of an energy and an ingenuity quite uncommon among the people of the race to which they belong.

The fishermen, who inhabit a string of villages which stretches along the whole of the Trengganu coast-line, work very hard during the months between March and November, and in that time are enabled to win a sufficient sum to keep them in comfort in the close season when the north-east monsoon renders fishing impossible. During these three or four months of enforced idleness, the fishermen build and repair their boats and houses, make and mend their nets, do a little planting, and generally pass their time in performing odd jobs; but for them the year's work practically begins and ends with the breaking and the return of the monsoon.

The existence of a comparatively large manufacturing class in Trengganu is partly due to the fostering care of the *baginda*—of whose interest in manufactures mention has already been made—and is partly the result of circumstances, the large population of the lower portion of the country necessitating unusual exertion on the part of the natives, in order to render it possible for them to earn a livelihood. The chief articles of manufacture are silks, cotton fabrics, native weapons, and metal and wood work. The weaving is done almost exclusively by the women, the men confining themselves to aiding in procuring the ingredients from which the numerous vegetable dyes are prepared, devising the patterns, making and setting up the looms, and disposing of the silks and cottons when ready for sale. The other articles of manufacture are all made by the men.

The *kain benang emas*, silk cloths with gold thread interwoven in the fabric; the *kain limau* and *kain prang rosak*, two kinds of watered or shot-silk cloths, are the best product of the Trengganu looms, and fetch high prices in all parts of the Peninsula. The *kain sarong siteru*, or silk Malay waist-cloths, manufactured in Trengganu, are admittedly inferior to those made in Kelantan and Pahang, both in texture and in the durability of the dyes employed. The proper price of the best qualities never exceeds \$4, whereas \$5 is the recognized price of the silk *sarong* made in the other states on the east coast. Trengganu, however, as I have already remarked, may be aptly described as the Birmingham of the Peninsula, and much ingenuity is displayed by Trengganu weavers in imitating the manufactures of Pahang. A large number of Trengganu *kain sarong* are sold as Pahang cloths, and it is often not until the dyes begin to run and fade after a week's wear, that the deception is detected. In the same way, large consignments of white

cloths shot with gold thread, such as are much used by the Arabs for turbans, are annually despatched to Mecca, where they are retailed to the confiding Malay pilgrims as real Arabic manufacture. The speed with which these cloths fade and wear out is again the only manner in which the purchaser can discover the fraud of which he has been a victim. Many of the cotton fabrics are extremely good of their kind; but here, again, ingenious imitations are made of other cloths which are better known and more highly valued by the natives of the Peninsula and Archipelago. The large cotton sarong imported from Celebes, which are called kain bugis by the Malays, are among these which are most successfully copied; but the kain benang halus, which is the best imitation of these fabrics, is a very good article, and is usually worth the money paid for it.

The metal ware made at Kuala Trengganu is also very good of its kind. The chief articles made are the numerous brass vessels with which every Malay household of standing in the Peninsula is furnished, and as the Trengganu ware is at once graceful and excellently finished, considerable quantities are exported to all parts of the Peninsula, but especially to the states on the east coast. To the manufacture of the ordinary brass vessels the natives have added an art which is said to have been taught to them by one of the artisans who were brought from Dalk by the baginda, the secret of which is jealously preserved by those who hold it, and which, to the best of my belief, is not known in any of the other native states. I refer to the casting of brass with certain alloys and ingredients which produce a white metal—*tembaga putih*, "white brass," as the natives call it—the colour of which is not unlike that of nickel-plating. All manner of vessels of use in Malay households are made from this metal, and, whether sold in Trengganu or exported to the other states on the east coast, they fetch a price nearly four times that of ordinary brass utensils. Thus a set of five chamber, or small receptacles used for holding the ingredients for areca-nut chewing, is valued at from \$6 to \$8 according to quality, if made of this metal, as against \$2, which is the price for a set if made of ordinary brass.

In addition to the brass ware, all manner of knives, daggers, swords, spears, pruning-knives, and choppers, are made in Trengganu, many of which are of excellent workmanship, the parang, or rough native knives used for jungle work, being especially cheap and good. In the making of weapons, however, the imitative faculty of the Trengganu artisans again makes itself seen, almost exact imitations of the best-known and most valuable kris—those imported from Celebes and Java—being turned out weekly for sale and export, the silver watering on the blades being ingeniously contrived to present an appearance of age. Needless to say, this damascening disappears from the blade after a little wear, much as the dyes fade from the silk of a reputed "Pahang" sarong of

Trengganu manufacture. The inlaid silver work on the smooth blades of some swords, etc., is also imitated from foreign designs, and this too is apt to prove to be of anything but a permanent description. Nevertheless, the Trengganu metal-smiths can turn out very excellent work when it is worth their while to do so; and if an order for any article is given to them, they not infrequently inquire whether it is required for use or sale. In the former case, it is made as well as they know how to make it; in the latter, its qualities are designed more for show than permanency. The publishing manner in which a Trengganu artisan will praise the antiquity of some article which he has made with his own hands, and the absolute indifference and absence of *mauvaise honte*



BRIDLE-PAATH BRIDGE.

which he displays when his deceit is exposed, have given to the people of this state the reputation as unequalled liars which is popularly ascribed to them by a vernacular proverb current in the Peninsula.

The workers in wood also devote their energies to making numerous articles for native use, the most elegant of which are the sirih boxes, or cases for holding the ingredients for areca-nut chewing, the surfaces of which are covered by thin layers of the beautiful kemuning wood (*Muraya* sp.). The grain of this wood is beat, and the colours are most handsome, in that portion of the root which extends above the ground and joins the trunk at a height of about 6 inches from the base, and the banir, as this part of the root is called, is accordingly greatly prized, and fetches a very high price. The kemuning in Trengganu, I am informed, have now been almost all destroyed, and the wood used by the

natives of this state is chiefly imported from Sumatra and other parts of the Archipelago. Though utilized, as I have said, for sirih boxes, etc., the banir of the kemoning is principally used for making the handles and hafts for the sheaths of Malay weapons; and, seeing that a number of kris, etc., are annually exported from Trengganu, the carpenters are kept fully employed making the wooden fittings for the blades forged by the smiths. In addition to this, some fairly good wood-carving is also done by the natives of Kuala Trengganu. It is chiefly devoted to house ornamentation, but, like all Malay art, it is of a very unoriginal and primitive stamp.

Boat-building is extensively carried on in Trengganu; but here, as elsewhere in the Peninsula, the boats are made by the natives chiefly for their own use, very few being exported to other states. The native boats for both sea and river use are good, but the latter are inferior to those made in Pahang, which is probably due to the fact that the rivers in the latter state are for the most part swifter than are those rivers in Trengganu, which are navigable for large boats. The sea-going crafts are much like those in use in all the states on the east coast, but the single-mast boats, called *jalak*, which are the favourite sailing-boats on the Pahang coast, are not in use among the people of Trengganu. Boats are built on a European pattern, the art having been first taught by one of the *baginda's* workmen, who was presented with a Singapore-built gig for use as a model. The wood used for this purpose is oak imported from Siam, and the boats, in model, in workmanship, and in finish, are infinitely superior to anything which the dockyards of the Straits are accustomed to produce. As no machinery of any kind is in use, these boats take a long time to construct, and their cost is prohibitive, \$300 being the price of an ordinary four-oar.

From this slight sketch of the principal manufactures of Trengganu, it will be seen that the natives are far more ingenious than the Malays of any other part of the Peninsula; but, like all their race, their genius is imitative rather than creative. A people so conservative as the Malays, who are so wedded to their ancient customs, whose chief standard of excellence is antiquity, who act by precedent, and argue by quoting old saws and ancient sayings, are hardly to be expected now to produce anything which they have not copied more or less directly from a model, or from a traditional pattern, and the energy of any section of such a race is to be gauged rather by the extent of its imitative faculty, than by the amount of its originality. Judged by this standard, and compared with their neighbours in the Peninsula, the people of Trengganu certainly rank high; and it may safely be said that no other Malay State could produce a man capable of making a steam-launch after paying a few visits to the engine-room of one of the local coasting-boats. This vessel was made from a native hulk, into which engines, made chiefly of old kerosene-cans, had been fixed, and to this moment I never

know whether the most admiration is due to the ingenuity of the constructor, or to the hardihood of those who trusted themselves to a craft so constructed.

The agricultural classes are chiefly employed in the cultivation of rice, maize, tapioca, yams, gambir, coconuts, sugar-cane, and fruit trees. Rice is, of course, the most extensive and most important of all the crops, and the modes of planting employed are precisely the same as those in use in Pahang, and in other states on the east coast. Rice is planted in three ways: in irrigated swamps, in plough land, and in dry clearings. The first method, here as elsewhere, gives the best results; but, owing to the initial expense and difficulty attending the irrigation of land, it is less commonly adopted than are the other two methods of planting. Taking the land under rice in Trengganu at one hundred, the proportion of land cultivated in each of these three different ways would probably be, approximately, irrigated land ten, plough land sixty, and hill plantations thirty. The preponderance of plough land over temporary clearings, which is not usual in independent native states where the latter form of cultivation is not discouraged, is to be accounted for by the fact that in Trengganu, owing to the crowding of the population into a comparatively small area, all the suitable planting land below the Kelemang falls is owned, and cannot, therefore, be taken up by any one who has a mind to do so, as is the case in most parts of the Malay Peninsula. The tools and instruments used by the agriculturists are as primitive here as elsewhere, and the alacrity to imitate better methods, which is so conspicuous among the manufacturing classes in this state, does not appear to have extended to the planters. The annual consumption of rice in Trengganu must be about 6,000,000 *gantang*, or 300,000 *pikul*. Of this, nearly a third is imported from Siam and the Straits, and therefore the agricultural population, which annually consumes about 3,000,000 *gantang*, or 150,000 *pikul* of rice, only produces a few thousand *pikul* in excess of its own requirements. The price of rice on the coast is from eight to nine *gantang* for the dollar, or from \$2.50 to \$2.22 per *pikul*. Up-country in Dungun, Stin, and Besut the price of rice is sometimes as high as \$4 per *pikul*; and above the falls in Trengganu the price does not usually fall far short of \$6.66 a *pikul*, or three *gantang* for the dollar.

Maize, tapioca, and yams are generally planted after the rice-crop has been garnered, and before it becomes necessary to prepare the ground for the next year's planting. None of these articles are the staple diet of the Malays, but they are often eaten by the people of the interior in lieu of rice when the crops have failed and the prices are beyond their means.

Coconuts are now cultivated, not only for the use of the natives themselves, but also for the copra, of which a considerable quantity is annually exported to Singapore. I was sorry to note that great ravages have already been made among the trees near Kuala Trengganu by the

coconut beetle. The groves which were first attacked were at the mouth of the Ibai river, and thence the beetles have spread up the coast to Kuala Trengganu, destroying almost every tree in their passage, and, passing behind the sultan's town, have extended down to the river-bank at Ilir-an. I endeavoured to impress upon the people the necessity for prompt action in order to save the coconut plantations above Ilir-an, but I fear that the present indolent administrators are hardly likely to take any steps to enforce regulations which, though advantageous to the people, would not result in any immediate increase of revenue to themselves.

Sugar-cane is grown in parts of the state, and the molasses, which are expressed by means of the clumsy native sugar-mills (*peng-lang*), and the coarse brown sugar manufactured, are consumed within the state, the demand more than equalling the supply.

KELANTAN.

Turning from Trengganu to Kelantan, I do not propose to write of the latter state in anything like the same detail I have employed in writing of the former. Although but little is generally known of Kelantan, it is by no means such a *terra incognita* as was Trengganu until it was traversed by my expedition. Mr. Bozzolo went to Kota Bharu—the Nenggiri, I believe—in 1868. Mr. Bailey went down *via* the Galas route in 1890; and Mr. Henry Norman went through Kelantan, coming down the Pergai from Legoh, in the same year. The Labir river, which was traversed from end to end by the members of my expedition, had never, it is true, been visited by any living European; but it was first explored some fourteen years ago by the late Baron Macley, a Russian naturalist, who, however, made no map of the country. None the less, there is much to be said concerning Kelantan which I cannot altogether omit from this account of our journey through the unprotected Malay States.

The coast-line of Kelantan is a short one when it is compared with that of Trengganu, the distance between the boundary-post on the seashore on the Kelantan side of the Besut river, and the spot above the delta of the Kelantan river which marks the boundary with Legoh, being not more than 45 miles following the contour of the coast, or about 85 miles as the crow flies. The Kelantan river, however, is navigable for large Malay boats for nearly 200 miles of its course, and the inhabited portions of the interior are thus far more extensive than is the hinterland of the Trengganu coast districts.

The Kelantan is formed by the confluence of the Galas and Nenggiri rivers. The Galas coming from the right and the Nenggiri from the left, form a junction at a spot distant about 100 miles from the sea, which is known to the natives as Kuala Sungai, or the mouth of the river. The name of Kelantan is given to the combined waters of these

streams below this point. The principal tributaries of the Kelantan proper are the Pergai on the left and the Liebir on the right bank, of which the latter is by far the more important, both as regards size, population, and possibilities.

The Galas river rises in the large range of mountains from which the Plus and Kinta rivers flow to Perak, and the Telom river flows to Pahang. It is the principal gold-mining district of Kelantan, and, though thickly populated by Malays, is also inhabited by a considerable number of Chinamen, the majority of whom are natives of Kelantan who have never visited China. The principal Chinese town in this district is Pulai, whence a path leads over a low range of hills to Kuala Jepar, on the Chadu—a river which, in conjunction with the Kasai and Serambun, forms the Seran, the principal tributary of the Telom river in Pahang. The best known of the gold-mines are situated at Kundor, on the left bank of the Galas river, a short distance from Pulai, which is on the right bank. These mines have been worked by both Chinese and Malays for many generations, and a large quantity of gold has been exported. Owing, however, to the primitive nature of the appliances at the disposal of the miners, the reefs and lodes remain for the most part untouched, the operations being almost entirely confined to sluicing and washing for alluvial gold. Some rude mills for crushing quartz are also used, but only the softer surface rocks can be treated by them, and then only in very small quantities. The Chinese community in this district is under the control of a Kapitan Chinaman, appointed by the sultan, who is directly responsible to him for the management of his people. The Malays in the Galas district are engaged in planting, etc., but a large portion of the population earns its livelihood by washing for gold, or by poling the boats, and doing other work for the Chinese miners.

The Nenggiri river is fairly thickly populated by Malays near its mouth, but the upper reaches and the surrounding district are inhabited almost entirely by aboriginal tribes. These consist chiefly of Tem-bo Sakai, who speak a dialect almost identical with that spoken by the Plus Sakai in Perak, with whom, indeed, they are said to hold constant intercourse. These tribes are said to number several thousand souls, and as they bear a bad reputation among the local Malays, the interior of the Nenggiri district is almost entirely given over to them, very few Kelantan natives ever penetrating far into this Sakai country, in many parts of which the Malay language is still unknown. I am informed that, unlike most of the wild aboriginal tribes, these Sakai have frequently committed depredations on Malays entering the district, and that more than once a strong raiding-party has been despatched up the Nenggiri by the orders of the sultan to keep the jungle people in check, and to punish them for their misdeeds.

The Pergai river rises in the hills which separate Jech from Kelantan, and passes quite close to the Temok mines. These mines,

which are situated in Legeh territory, were recently secured by a concession to a London syndicate, whose agents wrongly called the place "Temoh." All work, however, has ceased here for more than two years. The Pergai is inhabited by Malays, and by a few Chinamen; but it is of small importance, save as a highway to Legeh. When the Tomok mines were being worked, a stern-wheel steam-launch used to run up the Kelantan from Kota Bharu, the capital, to Kuala Pergai, and up that river to Kulai Balai. Thence stores, etc., were poled up-stream to a point about 30 miles distant, whence they were carried to the Tomok mines, which are only a mile or two away.

The Lebir river rises in Gunung Tahan, the high mountain whence the Kichan and Tahan rivers flow into Pahang. From its source to the point at which it falls into the Kelantan river is a distance of about 80 miles, and it runs through good agricultural and mineral country. No Chinese are found in this district, but it is thickly inhabited by Malays from Lanchar, above the rapids, to the mouth. When I first visited the Lebir in the summer of 1894, the country between Lanchar and Tenggilang was also thickly inhabited. Now, however, all the villages between Kuala Ampul and Lanchar have been abandoned by the orders of the Dato' Lela Derja, this being, in his opinion, the only way in which the people could be effectually prevented from aiding the Pahang rebels, should they return to the Lebir district.

The principal tributaries of the Lebir above the rapids are the Aring and Relai on the left bank, and the Pertang, Hawar, Kelinsar, Lebir Kechil, Miak, and Depak on the right bank. Below the rapids the only tributaries of any importance are the Rek and Pehi, by each of which a route leads to Besut. The Besut can also be reached by a route which leads up the Miak. The Kerbat district of Trengganu can be reached *via* the Pertang, Kelinsar, and Lebir Kechil rivers, and routes lead into the Tembeling District of Pahang from Kuala Durian, in the extreme Ulu of the Lebir, and up the Aring to Ulu Kendiam.

The Lebir has from time immemorial been the refuge of persons for whom trouble, war, oppression, or their own misdeeds rendered Pahang an undesirable place of residence, and accordingly the whole of the population above the rapids, and the large majority of the inhabitants of the lower portion of the Lebir, are Pahang Malays. From the time I left Ampul until I arrived at Kuala Rek, I never heard a single native speak Malay with a foreign accent, and in every village my Pahang men found numbers of their relatives, many of whom had been born and bred in the Lebir, but who still boasted that they were Pahang Malays, and not to be confounded with the Kelantan folk, for whom, in common with the rest of their countrymen, they expressed unbounded contempt. From a rough estimate, I should say that in the Lebir there must be nearly 3000 souls, all of whom are of Pahang origin. Since we came back to Pahang, numbers of these people have returned and

are returning to the Tembeling, having been induced to do so by the accounts given to them by the Malays of my expeditionary force, of the conditions of life in Pahang under the new régime.

The Lebir district produces a considerable amount of jungle produce, and the rice grown in the villages is more than sufficient for the wants of the people. The surplus is usually sold to the miners in the Galas district. Several rivers in the Lebir run through auriferous country, but no gold is worked here openly, as the people know that the Central Government at Kota Bharu would very soon appropriate the winnings of the miners; and would, moreover, probably force the people to work the mines without pay or a share in the profits. I have no doubt, however, that this district is capable of being enormously developed under a wise rule.

Unlike the Trengganu, the Kelantan river is but little obstructed by rapids. Light-draught steam-launches could certainly ply between the mouth and Kuala Sungai, and it is probable that they could ascend the Galas to the foot of the rapids, and the Lebir to Kuala Rok. The rapids in the Lebir, though numerous, are by no means formidable, and those in the Galas are even smaller. In neither case do they present any serious obstacle to river traffic.

The country through which I travelled in Kelantan presented an appearance similar to that of most parts of the Peninsula. The forests grow down to the water's edge, and are as impenetrable as most Malay jungles, save where they are threaded by the footpaths which form the only means of communication by land. On the banks of the Kelantan river there is a good deal of land under cultivation, but long stretches of virgin forest divide the villages from one another.

It is curious that, though the Kelantan and Trengganu waters flow from the watersheds which also give rise to the Pahang rivers, many species of fish which are found in the latter state are unknown in the former. In Kelantan no less than sixteen species are missing, all of which are common in Pahang; while in Trengganu twelve species of fish are missing.

The only species of fish found in Kelantan which is not known in Pahang, is a kind of large fresh-water sprat called *sluang-prah*; but in Trengganu there is no species of fish which I met with which is unknown in Pahang. By all the received theories with regard to the dissemination of fish-spawn, it is difficult to account for these facts, seeing that the rivers are of precisely similar nature, that their sources are practically the same, and also that several of the missing species are to be found in the waters of the Perak river-basin.

In Kelantan all the power is centred in the raja and the powerful chiefs who support him and keep him in the enjoyment of the position he holds. No partition of the revenue of the country has taken place here, and all the collections find their way into the royal coffers.

Nek * Sri Paduka and a few of the other chiefs alone sharing the profits of the administration with the raja. The other princes and chiefs have to trust to trade and to the occasional bounty of the raja for their supplies.

The Galas district is nominally under the charge of the Dato, Bentara, but he lives at Kota Bharu, as do all the chiefs, and he has no right to the revenue of the district, save such sums as may be granted to him from time to time by the raja. The debir district, in the same way, is under the charge of the Dato' Lela Derja; but he also lives at Kota Bharu, and is only an extra cog in the wheel by means of which the raja squeezes the revenue from his people. The kapitan, who is the head of the Chinese community in the Galas district, is responsible to the raja for the collection of the royalty on gold; but the system is worked in so unbusiness like a manner that, though the people are overtaxed and ground down, a large portion of the legitimate revenue remains uncollected, while the distribution of taxation is wholly unequal and capricious.

The Kelantan river-banks are divided up into a number of village communes, over each of which a kueng, or headman, rules, who is directly responsible to the raja. Their chief duty is to aid in collecting revenue from their people.

Serab, banchi, forced labour, and all the other devices known to Malay rulers, are employed as means of obtaining revenue, and hard as is the lot of the people of Trengganu, that of the people of Kelantan is in no degree less unfortunate.

The law is administered on the same lines as those which are followed in Trengganu, but the barbarous punishment of mutilation of the hand for theft, and many of the other more cruel enactments of Hukum Shara are still enforced in Kelantan. The gab, or cage cells, in which criminals are confined, are exactly like those I have described in writing of Trengganu, but the cages are more numerous, and the number of the inmates is greater. The ranyat here, as elsewhere in Independent Malay States, has no rights of person or property, and he is only regarded by his rulers as a source of revenue. The people are miserably poor, and the debt-slave system is here carried to a greater length than in Trengganu, Kelantan natives freely selling their children for a few dollars a-piece.

The principal exports from Kelantan are gold fish and silk and cotton fabrics. A little copra and a few shipments of oranges are also made annually.

The principal manufactures are silks, cotton, and pottery. The former are probably the best fabrics made by the natives of the Peninsula, while the latter are both good and cheap. The ingenuity of the Trengganu natives, however, has no imitators among the artisans of Kelantan.

* Nek is a contraction of *Nenek* = a great-grandfather. It is used as a title for a chief in Kelantan and Petani just as are *Tu* and *Wato* = a grandfather.—H. C.

The bulk of the population is engaged in agriculture, but, owing to the primitive modes of cultivation adopted, the rice produced is altogether insufficient for the requirements of the people, and a large quantity is annually imported.

About fifteen years ago Kelantan was the most thickly populated Malay state in the Peninsula, but a series of misfortunes has done much to damage the prospects of the country, and a great exodus, which the authorities have vainly attempted to arrest, has taken place during the past few years.

The first calamity which befell the country was the "Great Wind"—a typhoon which levelled miles of jungle to the ground in about 1890, and did an enormous amount of damage to property. Next came the buffalo disease, a kind of staggers, which carried off nearly sixty per cent. of the cattle and buffaloes in Kelantan; and cholera, which broke out shortly afterwards, completed the temporary ruin of the state. Under the present government Kelantan can hardly hope to regain its lost prosperity, but I am none the less convinced that, if well administered, it is capable of becoming one of the finest and richest states in the Peninsula.

The religious fanaticism of the late prime minister, Maha Mentri, had a certain temporary effect upon the natives of Kota Bharu and the lower districts of Kelantan; and the present raja has done something to perpetuate the traditions of his former minister. The bulk of the Kelantan, however, are far too ignorant to be capable of any great enthusiasm for the faith they profess but do not understand, and the action of the Maha Mentri, who endeavoured to suppress the travelling theatres to which the people are so much attached, and who was ever ready to—

"Prove his doctrine orthodox
By apostolic blows and knocks,"

has done little to make religion popular in the state. Those entering Kelantan would never have to contend against religious prejudice or fanaticism.

This sketch of the two little-known states traversed by the members of my expedition, cannot pretend to be more than the most cursory description of the countries, their people, and their products. I trust, however, that such information as I succeeded in collecting during my short journey in Kelantan and Trengganu may prove to be not wholly devoid of interest.*

MR. CLIFFORD'S MAP.—The coastline has been taken from the latest Admiralty Charts. The survey of the interior has been adjusted according to the positions of Kuala Lipis and Kuala Tembeling, as given on the map published by the Royal Asiatic Society, 1891.

* For the discussion on this paper, see the conclusion of Mr. Black's paper on Siam, vol. vii. p. 449.

RESEARCHES IN KARIA.*

By W. R. PATON and J. L. MYRES.

THE following notes summarize the geographical results of a series of short journeys made by Mr. W. R. Paton in 1893, partly at his own expense and partly by the aid of grants from the Royal Geographical and Hellenic Societies. Mr. Paton was accompanied in the peninsula of Myndos by Mr. J. L. Myres, Craven Travelling Fellow and Burdett-Contts Scholar of the University of Oxford, with whom the whole material has been worked up conjointly.

The inscriptions copied during these journeys, a detailed discussion of the ancient sites, and an essay on the types of tombs in this part of Karia, will be published in the *Journal of Hellenic Studies*, vol. xvi. pp. 188 ff., and Mr. Myres' geological observations elsewhere.†

The area covered by these journeys includes the coast of Karia from the mouth of the Meander southward to the peninsula of Knidos, and the interior as far as the upper waters of the Meander, and the longitude of the head of the gulf of Keramos. Most of the well-known sites have been visited; but the main purpose of the exploration was to reach outlying districts, to determine ancient lines of communication, and to verify the physical features and general topography by a more detailed survey than is embodied in Kiepert's large map. The peninsula of Myndos, which is full of early remains, was mapped on a larger and more elaborate scale, the results of which, with the sketch-map of the remainder of the district, are appended.

This essay should be taken in close connection with the independent work of MM. Hula and Szanto, since published in *Bericht d. K. Academie* (Wien, 1894), and with Tchihatcheff's paper in Petermann, *Mith. Ergänzungsheft*, No. 29.

I.—FROM KERAMOS TO MARSHAL VALLEY—KARTAL DERE—
MUGHLA—CHINA CHAI.

The long valley which reaches the sea at Keramos is called the Kartal Dere ("Vulture valley"). Only the lower part of it is indicated in the Admiralty charts and in Kiepert's maps; and in the latter the whole topography of its upper part is mistaken.

Immediately above Keramos, the stream—which is dry in summer, but is provided with wide water-gates in the town walls—passes a short narrow defile between spurs of the Kiran Dag and the southward extension of the Marishal Dag; above which the valley expands for a little, still trending northward, with side valleys on the eastern side spanned by the Roman aqueduct of Keramos. A few miles further

* Paper read at the Royal Geographical Society, May 13, 1895. Map, p. 120.

† Cf. 'Brit. Ass. Report' (Nottingham), 1893, p. 746; and *Jour. of. Oxf. Jun. Science Club*, vol. II. No. 33.

up the valley bends sharply east, and contracts into a long narrow gorge, which turns the south-east flank of the Marishal Dagh, and subdivides into a number of habitable head-streams. Of these the most easterly is the longest, rising south of Yerkessen, between Pisi and the peak of Sakar Kaya.

The Kartal Dere basin is therefore contiguous with the basin of Yenijé to the east, with that of Pisi to the north-east, and with the head-waters of the China Chai to the north. The great gorge is impassable, and communication between Keramos and the neighbourhood of Mughla is maintained either along the northern slopes of the Kiran Dagh, or by a path over the Marishal Dagh from Chivelik to Yonaluk, and thence by Pirnari to Keramos. The existence of the latter route is determined by inquiry at Mughla. There is indeed a path from Baghyaka, down the upper part of the valley, and up the cliffs to Sarij village, but it is not practicable for beasts, and for men only with ladders of notched pine-trunks. The country between this valley and the northern face of Kiran Dagh is a magnificent pine forest, feebly exploited by Greeks from Mughla and Mylasa. An ancient road over the Marishal Dagh from Stratonikeia to Keramos is reported by a Greek deacon of Yasghirlar, the Christian village below Penjik, an indefatigable explorer. It went by Panamara, up the valley of Kanervas, to the head of the Kai Dere, and hence across the Marishal Dagh to Pirnari and Keramos. This remains to be verified.

The alternative road on the south side of the Kartal Dere is marked by a series of ancient sites. There are small forts at Sarij, Baghyaka, Kiuchik Pelen, and Yerkessen, a Rhodian (?) city site at Sarij (2200 feet), and a small unwall'd settlement or sanctuary, with a gigantic plane tree, between Sarij and Deniz Otasi.

A natural marvel is pointed out at Kiuchik Pelen: a spring from which there is a strong escape of an odourless gas (probably carbonic acid, J.L.M.). The water is said by the natives to be instantly fatal to all animals that drink it except jackals.

The comparatively gentle slope eastwards from the head-waters of the Kartal Dere towards Yerkessen leads to a series of plateaux, the waters of which find their way to the sea by underground channels. The plains of Pisi and Mughla, and other smaller ones in this neighbourhood, are completely encircled by mountains like the upland plains of Arcadia and Crete, while numberless springs come out under the Kiran Dagh along the coast between Keramos and Jiava.* We might well some day happen upon traces hereabouts of a hydra legend like that of Lerna.

The plain of Mughla in Kiepert's most recent map is wrongly shaped, but rightly in his earlier ones. At Mughla itself he does not mark the Hellenic fortress on the flat-topped hill above the town. Its

* Usually written *Giosa*.

wall is fairly well preserved on the east side; the other sides are precipitous, and perhaps were never artificially protected.

The basin of Piri (the ancient Pisyra) and the two ancient sites it contains have been explored by the Austrian expedition of 1891.*

The hills which surround these "kettles" are devoid of trees, and it is only beyond the high range east of Mughla that the pine forests begin again. The reason of this striking distribution of them is probably geological; for at Yerkessen, and several other places on these hills, the ordinary limestone is replaced by marble. This is clearly to be connected with the fact that we are here again approaching the axis of the Latmian anticlinal; and, in fact, the Latmian gneiss reappears in the China Chai basin, and reproduces all the physical characteristics of the Besh-Parmak range (p. 51, below).

The China Chai is the southernmost head-water of the Marsyas, which reaches the Meander opposite Tralles. Like the Kartal Dere, it has a more or less open upper basin, converging upon a long, narrow, and unprofitable main valley, which runs nearly due north to its junction with the Mesevli Chai, which comes in from the east at Inje Kemer. All this is in the gneiss country already mentioned; there is a small fort between Kafaja and Karakoyun, and three small sites, at Boz-Armud, Elekji, and Almajik, along the modern road which follows the east slopes of the China Chai valley. At Inje Kemer ("thin bridge") is a fine Roman bridge across the China Chai; it formerly supported an aqueduct, but now carries a difficult and unfrequented road from Arab-Hissar (Alabanda) up the Mesevli Chai. After this, the valley expands, and Alabanda lies a few miles below the junction.

II.—KERAMOS TO BUDUM.

The next valley west of Keramos and the mouth of the Kartal Dere drains the west slopes of the Marishal Dagh, and the east slopes of the Kara Dagh, and the hills over Vasilika. The number and volume of the springs in it above Dere-Keni, which unite to turn a number of mills, indicate a large subterranean drainage system in the unexplored Marishal Dagh. Kiepert gives the name of Kara Dagh to the Monastir Dagh, and has missed the real Kara Dagh, a much loftier, and from all sides more conspicuous peak, which forms the watershed between the valley of Dere-Keni, just described, and the south-east head-waters of the Sari Chai, and is the east end of the continuous line of hills between the Sari Chai and Kar-Ova basin and the Keramic gulf. The Dere-Keni valley is the natural line of communication between Keramos and Mylasa via Karaja Hissar (Pedasa); the old road seems to have skirted its head-waters over the spurs of the Marishal Dagh.

At Ishek Dere there is a pre-Hellenic fortress, and another on a high peak south-east of it.

* See *Beundorf Anzeiger der hist. Klau der Universitäts*, No. xvii.; Vienna, 1892.

The pass between Ishek Dere and Yenikeul is only some 700 feet high, and is, perhaps worth noting as being the obvious line for any future high-road, or even railway, from the lower Meander valley and Mylasa into South Karia and Lykia.

A little below Yenikeul, the streams from the Marishal and Kara Dagb form a perennial stream, rapid and full of fish (the Ak-Chai of MM. Hula and Szanto*), which drains the north slope of the Marishal Dagb and Kartal Dagb, and the south and south-east slope of the Ak Dagb and Penjik Dagb, and runs up within a few miles of Panamara. Its long, narrow, enclosed valley is called the Kai Dere ("Deer valley"),



RIVER DAGB, FROM DAGB-YAKA.

a wild, thickly pine-clad glen with a few isolated houses, whose inhabitants fled at the unwelcome sight of strangers and eunuchs; hence loss of track and temper, and a night in the open.

Some two miles below the confluence with the Ak-Chai on the (south) left bank, and bounded on the west by a small valley northwards through the Kurun Chiflik from Kara Dagb, lies the important site of Karajâ Hisar, first visited by MM. Doublet and Deschamps,† and rightly identified by them with Podasa. It is a Hellenic fortified town, containing a theatre and other public buildings. The inscription published by MM. Doublet and Deschamps is from a building dedicated to Titus, which contains another fragmentary inscription, published by Messrs.

* "Bericht," p. 25.

† *B.C.H.*, vol. xiv. (1890), p. 627.

Hula and Szanto.* A little excavation here would be very easy and profitable. No coins have been found here as yet. Below Karajá Hissar the main valley turns more northwards to skirt the prominent Monastir Dagħ (1700 feet; Kiepert's "Kara Dagħ"), and descends, turning several miles through a narrow gorge westwards again past Alan Bagħche and Yaka-Keni to the confluence of the parallel stream north of it which comes down from the north slopes of the Ak Dagħ past Kalin Aghil and Aghasli Oyuk. There is a small site a little south of the latter place.

On the other side of Monastir Dagħ two valleys originate—(a) the Yemikler Dere runs first west nearly parallel to the valley of Yaka-koi; then turns south-west to Sirtmesh Kalé; (b) the other runs first south past Bagħajik, draining the west and south slopes of the Monastir Dagħ; then west and north-west past Chokier into the Kar-Ova plain, to meet the main stream running north from the Kaplan Dagħ coast range near Etrim (Theangela), into the gulf of Barygia. Any road from Pedasa to Theangela must have followed this valley route south of the Monastir Dagħ, and past Kirsalar.

The hills between Yemikler Dere, Bagħajik, and Kar-Ova are crowned by a notable fortress above Cholmekji Keni, and by numerous tumuli, all of which must be taken in connection with the Sirtmesh Kale site on the spur above Uch-Bunar, which is now decisively identified with Kindya. The site of the celebrated temple of Artemis is immediately opposite, across the Yemikler Dere.

The Kiran Dagħ ("Kerenda" of Admiralty Chart), which lines the north shore of the Keranic gulf from Keramos to Jiova, has fewer valleys leading to the sea than Kiepert's map indicates after Tchihatcheff; in particular, the large valley running north-west would cut across the Kartal Dere if it existed as far as it is marked. The seaward slopes are very abrupt, and leave room for no coastland. Between Keramos and Jiova (Idyma) the only harbour is that of Akbuk, where there is a Rhodian watch-tower in fairly good preservation.

The Karu Dagħ and the whole coast range between Keramos and Halikarnassos are still unexplored. Their northern slopes drain into the Karajá Hissar valley and the Kar-Ova plain.

Kiepert places Bargasa at Vasiliká (Fazlikan Yailasi), but there are not at all enough remains there to justify this. Ptolemy's indications, an inscription published by Buresch,† and the fact that its coins are mostly brought down from Aidin, make it probable that it will be found somewhere north of Amyzon and Alabanda.

The limits of the Kar-Ova plain, and the position of its many villages, have not yet been properly defined; Kiepert is inaccurate, and assumes a village of Kar-Ova, which does not exist. MM. Hula and Szanto promise a fuller account.‡ The hilly country between the western

* Bericht, p. 28. n.

† *Mith. Ark.*, vol. xix. p. 102.

‡ Bericht, p. 23.

border of the Kar-Ova and Budrum is of a very porous variety of the limestone, and remarkable for its absolute lack of water. The whole supply is now derived from cisterns. At present there is not a single village in this district, but the numerous apparently pre-Hellenic remains show that it was well populated at a remote period. The southern part of it, as far as the coast, is a large *chiflik*, now the property of a Greek of Kalymnos, M. Mangli,* drained by a fan-shaped basin from Kizil Aghach to Alezeitin.

In this waterless upland between the Kar-Ova and Budrum, the old road coincides with the modern, keeping close under the conspicuous



INIA KEMER.

range of hills which lines the northern coast, and crossing the heads of the southward basin of M. Mangli's *chiflik*. The route is indicated by a long series of Karian and Hellenic chambered tombs.

About an hour and a half south of the road, on the south side of the easternmost tributary of the Mangli stream, the unidentified Karian town of Alezeitin still stands as it was left at the incorporation of these districts with Halikarnassos by Maussolos in the fourth century *b.c.* Walls, houses, and public buildings of rough masonry, often with Cyclopean basements, remain unburied and mainly erect. We found no inscriptions or fine pottery, but a portico with notable proto-Ionic capitals gives a clue to the type of culture which the place enjoyed.

Leaving Kizil Aghach and the Mangli *chiflik* to the south, ascending the western valley head of the northward stream which debouches at Durvanda, and taking up the old route from Bargylia to Halikarnassos,

* Kiepert's "Evangelii."

the road now crosses an easy pass, where the earlier track is visible, and descends by a series of recent zigzags into the deep river-bed which traverses the Greek quarter of Budrum.

III.—THE PENINSULA OF MYNDOS.

The peninsula of Myndos, on the isthmus of which Halikarnassos stands, differs wholly in its physical features from the adjacent mainland, which has been described above. The thick waterless limestone extends, indeed, some 5 or 6 miles beyond the isthmus, and ends in a fine group of hills, the Kara Dagh (Oglou Dagh of Admiralty Chart 1604), with an abrupt escarpment northwards, and very steep slopes on the west still covered with the remains of pine forests, though much thinned by fires. But the mass of the peninsula consists of crystalline rocks, which emerge from beneath the limestone along an anticlinal whose axis lies north-west and south-east between the island of Patmos and the eastward half of the Knidian Chersonese, in both of which areas the same or similar rocks recur. The limestone reappears on the seaward slope of the anticlinal with south-west dip, in the north of Leros, in Kalymnos, and Kos, in the eastward half of the Knidian Chersonese, and in the island of Syme.

This anticlinal is obviously very nearly parallel to that of Latmos, and probably belongs to the same series of earth-movements. Its formation was partly earlier, partly later, than the deposition of the great limestones, and was attended in both periods by very considerable volcanic activity. The fundamental gneiss, which is not unlike that of Latmos, is honeycombed with dykes and masses of intrusive matter of very various character; and the few outliers of limestone which occur are wholly transformed into a white marble not unlike that of Samos.* The whole area is overlaid by thick masses of volcanic *débris*, which in many places are rolled and stratified by marine action, and on the north coast of the peninsula have a decided seaward dip; and, being very readily eroded, give rise to a most characteristic type of scenery, with precipitous escarpments buttressed and embattled in the most fantastic forms. The peninsula may be subdivided as follows: (1) The limestone country north of Halikarnassos is, as above mentioned, simply a continuation of the mainland area. (2) South-east of it is an undulating lowland of volcanic *débris*, drained into deep bays of the gulf of Kos, (a) by the stream which flows from Ghick Chalar past Bites; (b) by the Episcopi river, one tributary of which rises far round the north-east spur of Kara Dagh, above Pelen, and the northern watershed of which is within a couple of miles of the bay of Sandamah. (3) The highlands of Tormera, or "south range," extend in a series of very bold peaks

* The *Afios Arachis* of Mylasa (Strabo, 638) is not marble, but a fine compact limestone like that of Mount Zenn in Naxos.

rising to 1300 feet south-eastward from the lower course of the Episcopi river to the extreme point of the peninsula towards Koa. (4) The wide and fertile Akeherenda valley drains the north slope of the south range, and the south slope of (5) the highlands of Myndos, which are intersected by its principal northern tributary, the Dere-Keni stream. These hills attain a height of 1200 feet at B., and of 1700 feet at Q. (*vide* map); with the exception of the fertile plain draining into the harbour of Myndos, they allow of no coastland, until on the north coast (6) the valley of Sandama is reached. This and the adjacent lowland of Tremil are connected by easy passes with the top of the Episcopi valley,



TREMIL.

and by a fertile valley eastwards with (7) the valleys of Farelia and Ghicl, which drain the north side of the Kara Dagh, beneath the great limestone cliff, and form the ancient territory of Karyanda, while Telmessos held the upland forests and pastures of Kara Dagh. The bay which marks the north side of the isthmus receives streams from the very abrupt gorges which come down from Ghink Chalar, and also the northward stream already mentioned (p. 43), which comes down from the high-road in the neighbourhood of Kizil Aghach. It will be convenient to follow this series of subdivisions in describing the sites and roads in the peninsula. We have nothing to add to existing accounts of Halikarnassos, except a few inscriptions,* and a note of the probable course of the principal roads thence into the peninsula.

* J.H.S., vol. xvi. Nos. 5 and 6.

1. There are traces of an old track in the deep ravine which leads directly north from the north angle of the old town towards Ghiuk Chalar; from Ghiuk Chalar a road passed northward, accompanied by tumuli, over the eastward ridge of Kara Dag, descending past a large Byzantine church into the eastern Ghiol valley, probably joining the Karyanda-Bargyia road.

2. From the west gate of Halikarnassos, the old road to Myndos follows very closely the line of the modern one. The road to Telmessos followed a wide ravine through the Kara Dag, descending upon the Apollo Temple below Telmessos, where there are traces of a well-worn track, and from thence into the Ghiol valley to Karyanda. Further on again, from Episcopi, a cross-road led up the Episcopi valley and down upon Sandama. This road also is very deeply worn in several places near the top of the pass; and another track, with windmills over a pass further east, past the fort at Tremil, to the small towns round the bay, is evidently of great age. The main road to Myndos can again be traced further on, over the watershed at Kiureji, where there is a small fort on the hill M. It is closely followed by the modern track:

3. The course of the direct road from Halikarnassos to Termora (Assarlik) is not clear. That from Myndos to Termora, and to its little port, can be traced near Kadi Kalessi; across the ridge close to the west end of Assarlik, the hollow way is from 10 to 15 feet deep.

4. From Myndos northward a coast road passes a succession of small forts and settlements, including that at Tremil above mentioned, and eventually reaches Karyanda (Paralia), and so joins the Halikarnassos-Bargyia road at Durvandâ.

Termora is certainly at Assarlik, and is so marked in Kiepert's last map,* though the inadequacy of the shading makes it look as if it were clear of the south range. Kiepert formerly followed Newton in putting Termora at Chifut Kalâ, where there is one small piece of old wall incorporated in a mediæval castle. The topography is discussed in detail in *J.H.S.*, vol. viii. (W.R.P.), where a description of the necropolis is given, and a drawing of part of the fortress wall. The chambered tombs described by Newton† are in a valley on the north-west of the fortress, and a little to the west of the road.

Myndos itself has been repeatedly described elsewhere, and a drawing of the Cyclopean wall on the peninsula (which as at Knidos seems to have been the original town) is given in *J.H.S.*, vol. viii. (W.R.P.). It has no Lelegian necropolis, and seems to have been, unlike Halikarnassos, a thoroughly Hellenic foundation. Its continuous importance as a silver-working centre is attested alike by classical and mediæval tradition, and by its Turkish name of Giunushli. The beach round the

* 'Forum Orbis Antiquum,' 1861, ix.

† 'Halikarnassos,' etc., p. 215.

bay south of the harbour is strewn with masses of slag from the silver-furnaces, one of which is well exposed in the hollow way to Kadi Kalessi soon after leaving the shore. All that remains is a circular pit some 4 feet in diameter, the sides of which appear to have been lined with clay, and are thoroughly baked into brick. The great silver-mine is to be seen on the range behind the town; the shaft is very irregular and of great size, and is full of water to within 30 feet of the surface. There are still veins of silver-lead in this neighbourhood, but "the most copious supply is now near Kephalukha," where much pyrolusite of very fair quality and a little cobalt have been observed." There is another vein of manganese in the gneiss underlying the white marble outcrops above Kadi Kale.

How far north of the town the coast belonged to Myndos, we cannot say with certainty. The next considerable towns are Telmessos and Karyanda (at Kara Dagb and Ghiol respectively).† But there are several small unidentified sites along the intervening coast, and as, for the fifth century at all events, we have a series of unidentified names of this same neighbourhood, it is perhaps worth while to attempt to bring them together.

The names are contained in the tribute-lists of the Delian League, which, though their arrangement is generally most irregular, occasionally gives short sections in geographical order; as though the log-book of one or other ἀρχυμολόγος εὐεῖα had been transcribed immediately on its arrival in Athens, and without filling in omissions from other sources. Putting the lists of 454, 450, and 443 B.C. together, we have a continuous itinerary from Bargylia (where the Kindyan tribute is brought down to the sea) to Termera, and beyond Myndos as follows: Kindya, Bargylia, Lepsyandos, Karyanda, Pasanda, Madanea, Pelea, Myndos, Kalydna (Kalyrna, the island), Termera, Halikarnassos. Now, Karyanda is at Ghiol Liman, on the north coast of the peninsula, with "city and harbour and island," as Strabo says.‡ Newton placed it long ago at Ghiol, Kiepert more recently at Táranda. But Táranda was never a considerable town, and, moreover, is wanted for the Ταραντος of British Museum Inscriptions, No. 826. Ghiol, on the other hand, has a fine Karian fortified town, with Hellenic additions, on the tuff escarpment above Faréliah village, and a considerable necropolis, Karian, Hellenic, and Græco-Roman, extending thence to the bay. We saw also at a house below, near Faréliah bay, a small Corinthian capital found in the neighbourhood; and were fortunate enough to acquire a fourth-century bronze coin of autonomous Karyanda, found on the

* Information from Kalymitotes, who were much excited, in 1893, by the discovery. We saw no silver or cobalt *in situ* at Kephalukha; only specimens in the bazar at Kalymon.—J.L.M.

† *Vale post*, and *J.H.S.*, vol. xiv. pp. 373 ff.

‡ The "island" is "Ag. Apostola."

western shores of Ghiol bay. We have discussed these verifications of Newton's conjecture in detail in *J.H.S.*, vol. xiv. pp. 373 ff.

In the same paper we described an important group of sites on the Kara Daglı—two towns, a temple site, and a fine chambered tomb, which we identify with the Karian Telmessos, on the evidence of a third-century inscription found on the temple site, and now built into a house in the village of Pelen. Kiepert had placed this Telmessos at Ghiol. Karyanda then being at Ghiol, Madnasa, Pelen, and Pasanda must be between Ghiol and Giumashli (Myndos). There is a large site with late potsherds and rock tombs on and near the isthmus of Sandama; but if this is Madnasa, Pliny has avoided mentioning its reoccupation after incorporation in Halikarnassos. The alternative site is Borghaz, with a fine pre-Mausolean fort and princely tombs. Pelen perhaps survives in Pelén, in the interior; there are a Karian fort and village here on the precipitous Turkman Daglı.* The road hence to the north coast passes Tremil, with a small settlement and fort out of the rocky bogs which crown the hill south-west of the village. This is probably the Termile which Steph. Byz. confuses with Termira. Pasanda remains to be accounted for. Azajik, a little fort between Giumashli and Borghaz, is too small, and on the wrong side of Madnasa, if the latter is at Borghaz; which suggests the question, is "Sandama" formed by metathesis from "Madnasa," or by accretion from (Pa)-māda, *quasi* *quāda*?

IV.—GENERAL DESCRIPTION OF GHION AND LATMOS.

The modern road from Miletos, following doubtless the track of the ancient road to Lasos, touches the shore of the Iasic gulf at a small peninsula called the Ada (island). After passing the low range of hills on which the Greek village of Ak-Kent† lies, it reaches, by a brief, but steep ascent, the northern edge of the plateau which slopes down to the sea south and west of Yéronda (Branchida). This plateau is a dreary waste now: it has no villages except the Greek and Turkish Yéronda. There are very few trees, but a thick undergrowth of "schinos" everywhere, except a few clearings in which corn is grown. These clearings lie in depressions which drain into deeply cut river-courses. The largest extends in a westerly direction, and the stream which drains it reaches the sea a little north of Kuvéla‡. It is called Haikli, from the *Agnus castus* (Turkish "haik") which grows in it (hence Kiepert's village of "Yakli").

The country was once, however, plentifully wooded with olive trees, of which a few remain; the rest have perished in the frequent fires which the peasants kindle to improve the pasturage. Each of the

* "Pyramid Hill" of Admiralty Chart 1546-1604.

† Akkia, Admiralty Chart 2836.

‡ Kuvella, Admiralty Chart 2836.

isolated farm buildings, which form the only landmarks, has its oil-mill, monolithic, of great size, and of immemorial age. The mass of pottery lying on the surface near these buildings shows that they have maintained their position for centuries, though they are now only used



BAGHLEZE.

as byres (Greek and Turkish "damia"). Tumuli are frequent from Ada to Dere-koyun along the Miletos road, are called "armakâdes" (*ἀρμακᾶδες*), and are explained by the natives as look-out stations for the shepherds. Grion is not quite so impassable as M. Rayet has stated.*

* 'Milet et la Golfe Latmique.'

A fairly good road from Dere-koyun at the head of the valley, running down to Kiepert's Pyrrha, leads *via* the Chatal Alan ("plateau of the fork") over the northern spur to a cistern on the shore of the Latmian gulf; a path, regularly traversed by beasts of burden, leads from Mersinet to Akbuk; and the road from Iasos to Yeni-Keni ("new village") and Mandella is quite an easy one, and is probably the ancient road from Iasos to Chalketor and Euromos. There is also a practicable track from Mandella to Akbuk through the Kurun Dere ("dry valley"). The greater part of the range, however, is very thickly covered with undergrowth, and it is therefore impassable except by regular paths. There is no extensive pine forest, but in the ascent from Mersinet to Kurun-Dere-Kale the pines become more frequent. At Mersinet itself there is a settlement of the curious Taktaji race, whose one occupation is wood-cutting; the men cut the trees, and the women saw them into planks. On the south side of the range springs are very rare; its northern side is richer in water, but even here there are no perennial streams.

From Mersinet and Bali to Mandella the road crosses a low pass about 700 feet, in the depression connecting the Grion and Latmos ranges. This is the only possible route for the railway to Mylasa which will be made some day; it need not ascend as high as the modern road, but at most some 500 feet, for there appears to be a lower, though less direct, pass than that followed by the road.

The plain of Mandella is traversed by a stream which flows into the Sari Chai below Talian, and derives its water chiefly from two valleys, the Derenje Dere and Kandak Dere. At the head of the Derenje Dere lies the village of Sakar-Kaya. Here numerous springs rise above a steep cliff, turn several overshot mills, and water the gardens of the Yailâ or summer quarters of the village. In the upper part also of the Kandak Dere and in Ghiol Dere ("Marah valley"), one of its tributaries, water enough is supplied to form small perennial streams. Their water disappears or is deflected lower down, so that at Derenje and Mandella the two rivers appear to be dry torrent-beds; but, as is usual in this country, the water reappears in the plains and forms the considerable stream which skirts the base of Grion and joins the more voluminous Sari Chai ("Yellow river"). The whole of the Latmos range is rich in water, but the only other perennial stream which issues from it is another Sari Chai, which runs in a northerly direction, passes near Amyzon, and joins the Meander.

The whole range is rich in iron, as the name Demirji Dere ("Iron-smith's valley") and others testify, and it was only ten or fifteen years ago that the actual production of iron ceased. It continued, after it had ceased elsewhere, at Sakar-Kaya, where Chandler noticed the workings.* There the iron ore is still to be seen, quarried and lying in heaps ready

* "Travels," p. 199.

to be smelted, and all about the hills there are traces of old workings in the most desolate and unexpected places.

Mount Latmos proper, the Besh-parmak, or "five fingers," which rise straight from the head of the old Latmian gulf above Herakleia, has a remarkable physical character, which is shared by its south-eastern continuation, for the slopes above Herakleia, the upper valleys, and the ridge itself are of the same geological formation. This is a characteristic gneiss, like the fundamental series in the peninsula of Myndos, the large smooth blocks of which are scattered at random over the country, and have provided perches for anchorites, though they are often quite



THE SITE OF TELMESSO FROM THE N.E. A.B. WALLED TOWNS WITH HOUSE WALLS STANDING; C. CHAMBERED TUMULUS. THE HILLS BEHIND A.B. OVERLOOK WHITE CHALAR.

(Sketch by Z. L. N., corrected from a photograph by W. R. P.)

unscaleable. The beehives here are regularly perched on the flat summits of such boulders as have all their sides sloping the wrong way, to repel the assaults of the bears which abound. It is this gneiss which confers their peculiar character upon the fortresses of Euren and Baghajik.* The gneiss extends to the head of the long valley (the Alinda branch of the Marsyas,† which runs down to Dere Keui and turns thence eastward to the Karpuzli-Ova ("Plain of Water-melons"); and the Aitauhsu peak is a small reproduction of the summit of Latmos. Tchihatcheff has described this formation as he found it on his route from Karpuzli to Mylasa, and notes it again in the Marsyas valley (China Chai). It exists also higher up the valley than he went; Wherever it exists, it

* J.H.S., vol. xvi. pp. 211, 212.

† Hula and Szanto, 'Bericht,' p. 2. Alinda is almost certainly identified with Demirci-Dorai.

‡ Vide above, p. 40.

imposes its character on the tombs and fortresses, as well as on the natural scenery.

The valley running down from Attaulusu to Dere-Keui is labelled "Menteshé" in our map, and Kiepert gives the same name ("Mandidja") to the whole region. The villagers at Chikur ("the hole") say that the valley is called Menteshé, and they point out a site, marked in our map, where an annual market, the Menteshé Bazar, was once held. The name Menteshé is that of the Seljuk conqueror of this district, and is the current name of the whole province of Mughla, just as that of his contemporary Aidin is given primarily to the province of Aidin, and secondarily to the whole vilayet; but there is not in Menteshé, as in Aidin, any town which bears the provincial name; and there are no apparent reasons why it was specially applied to this valley, or rather to the bazar once held in it, and also to the pass under Petsouna-Kale,* near Mylasa, which is known as the Menteshé Boghaz. These narrower uses of the name are probably derived from incidents unknown to us in the progress of the conqueror.

The peculiar gneiss formation ceases soon after we leave Chikur for Dere-Keui, and is succeeded by a series of dismal ridges formed by the basement beds of the limestone series. On these grow only a few wild pear-trees, which the natives are usually too lazy to graft. Descending this valley, crossing a low pass into that of the Sari Chai, and returning up it towards Mount Iatmos, we find the gneiss beginning again as we ascend. This Sari Chai valley is very sparsely inhabited, Kizil-buluk and Chavdar being its only villages; Baghajik is only a hamlet of four houses, with an early fort and temple site.†

The position of Chavdar in our map is based on W.R.P.'s latest (1890) observation. No authority is given for the route, incorporated in Kiepert's map, with Chavdar and "Kara-kaya." "Kara-kaya" is evidently Sakar-Kaya. There is no village in this region bearing the name of Kara-kaya; the nearest is beyond Besh Parmak; another above Myndos.‡

The limits of all large chifliks should be marked on all detailed maps of Asia Minor, as they probably represent territorial divisions of great antiquity, and often with very little modification. The principal chifliks of this district are three:—

1. Mehmet Bey's chiflik; entered shortly after passing Talian village in going from Mandelia to Tekirambar, where the owner lives.

2. Halil Bey's chiflik; frontier between Tekirambar and Aghasli-oyuk; residence at the latter place.

3. M. Demadi's chiflik; frontier between Aghasli-oyuk and Kalin-Aghil. It extends from Duz-Ova and Paterga, not far from Eski Hissar (Stratonikeia), to the deep Kai Dere described above (p. 41).

* "Petsouna Kale," Admiralty Chart 2836.

† J.H.S., vol. xvi, p. 212.

‡ "Garah," Admiralty Chart 1516-1604.

The plain of Mandellia itself is not a *chiflik*.

It will be seen that the indications above are only notes made *en route*; it is difficult to obtain information about landownership, and especially about the boundaries between government land and private property, without official co-operation and elaborate collation of documents. The more one works at it, however, the more one appreciates the importance of this kind of evidence.

W. R. P.—ITINERARY IN GRION AND LATMOS.

1893.	1893.
Sept. 18. To Kasikli.	Oct. 4. Chikur—Dere-keui.
" 19. Kasikli—Akbul.	" 5. Dere-keui—Amyzon—Kar-
" 20. Akbul—Karakoyun by sea (<i>Teichiossi</i>).	" 6. Kariklar—Sari Chai valley —Baghajik.
" 21. Karakoyun—Yeronda.	" 7. Baghajik—Sakar-Kaya.
" 22. Yeronda—Kuvula—Ak-keui.	" 8. Sakar-Kaya—Mandella.
" 23. Ak-keui—Kamaras—Ak- keui.	9-15. Arrested for travelling alone, and sent to Mylasa; the rest with a <i>zaptich</i> ordered to prevent map-making.
" 24. Ak-keui—Dere-koyun.	" 16. Mylasa—Kara-koyun.
" 25. Dere-koyun—Island in Deni- zli Liman.	" 17. Kara-koyun—Yeni-keui.
" 26. Island—Herakleia—Mer- sinet Yalla.	" 18. Yeni-keui—Alan-bakche.
" 27. Mersinet Yalla—Kale.	" 19. Alan-bakche—Dede (Mona- stir Dag).
" 28. Kale—Mandella.	" 20. Monastir Dag—Uch Bu- nar.
Oct. 1. Mandella—Narasar.	" 21. Uch Bunar—Kilbuk.
" 2. Narasar—Euren—Kale— Chikur Yalla.	
" 3. Attanusan.	

ADDENDA.

In a subsequent journey in the summer of 1896, W. R. Paton has been able to explore the northern slopes of the Latmos range from the Deniz Liman to ANAPASDA.

By boat from Sirjin to its winter village, Sirjin-Kishla; the fortified site, or "*Kastron*," on the north side of the Chamlik-Tépé, close to the shore of the Latmulan gulf, is of late mediæval character. Thence northwards across the valley of Arap, at the west of the entrance of which lies Myra, to Karaja-halk. To Karaja-halk a long valley comes down from Latmos, with the small village of Kiepralla in its upper part. Kiepert's map does not give this valley, and is consequently a little distorted in this neighbourhood.

Down to the main valley of the Menderes (*Meander R.*), and then up that of the Kish-Chai, which drains a considerable part of the northern slopes of Latmos. Both sides of this valley, as far up as the gorge below Akhiat, are thickly wooded with olives, from which the yield of oil must be considerable.

At Yevrelli-Keui is an ancient site, with double terrace walls of massive masonry on the edge of a steep torrent bed, with an abundant spring below. Two late Greek inscriptions in the village, in the possession of the *Agia*, will be published in *Journ. Hell. Studies*, xvi. Nos. 37, 38. Rock-cut tombs with heavy capstones, of the characteristic Latmulan type (*J. H. S.* xvi. forthcoming), were observed near

the road between Yevrell-Keni and Akhlst, and are said to be common on the hills in the neighbourhood.

Chavdar is situated at a height of 1900 feet on the watershed between the Kisir-Chai and Sari-Chai, and owns a large part of the upper slopes of Latmas, even beyond Arabarli Kalé and the highest peak. Only a small part of this is cultivated. The valuable pine-nut is the chief forest tree; and goats and bees are kept in large numbers, though the hives suffer much from the numerous bears. About an hour south-west of Chavdar are the remains of an older village, which, according to local tradition, was once populous. From near this village an old road can be traced into the neighbourhood of Arabarli Kalé, well paved, and skilfully conducted through very difficult country on terraces and bridges. A fragment probably of the same road passes the temple of Zewa Stratia at Baghajik.* At Arabarli Kalo is a mediæval ruin, apparently a fortified monastery.

At Teké-Kalé, on the highest point of the watershed between the Karpuzli-Chai and the China-Chai, is an ancient settlement with tombs of Latmian type, and an admirably preserved fort† visible from AMYXON, and probably built, like those at Attau-lu-su and Kurun-deré,‡ to serve as a signal station between TRALLIS and MYRIASA.

In this section the course of the river and the configuration of the country are wrongly given in Kiepert's map. Kiepert formerly identified Demirji Dereşi with KOSKINIA (*Karte de West. Kleinasien*), but in his *Formæ Orbis*, 1895, he gives this site rightly to ALINDA, which he formerly placed at Kapraklar, near Mesevli. The last-named site should probably be identified with HYLLARIMA; KOSKINIA should be looked for at or near Hazan Boghaz (not *Husan* Boghaz, as in Kiepert's map), and the road thence to ALABANDA (Strabo, 587) in the tortuous valley from Hazan Boghaz, which joins the China-Chai about an hour north of ALABANDA.

At Demirji Dereşi were found two inscribed bases (*J. H. S.*, xvi. Nos. 29, 40); another inscription, in the mosque, was inaccessible, as the *hoca* was away.§

JOURNEYS IN GOSHA AND BEYOND THE DESHEK WAMA (LAKE HARDINGE).

By CLIFFORD H. CRAWFURD.]

MR. CLIFFORD H. CRAWFURD, Acting Commissioner and Consul-General at Mombasa, has recently made seven journeys between Kismayu and Gosha on the Jub; he has ascended the river Jub four times to about 1° N., and has paid two visits to the Rer Hersi, a class of Ogaden Somal, who now occupy the country around the Aif Madu wells. The object of these visits was to persuade the natives to keep the peace, to do allegiance to the Queen, and to pay the usual tribute. In these respects he seems to have been completely successful. Incidentally he has made some interesting geographical discoveries. He is the first European, as far as we know, who has actually visited the Deshek Wama, a back-water lake connected with the lower Jub, first shown from native

* P. 52, above; cf. *J. H. S.*, xvi. 212.

† Plan and description are given in *J. H. S.*, xvi.

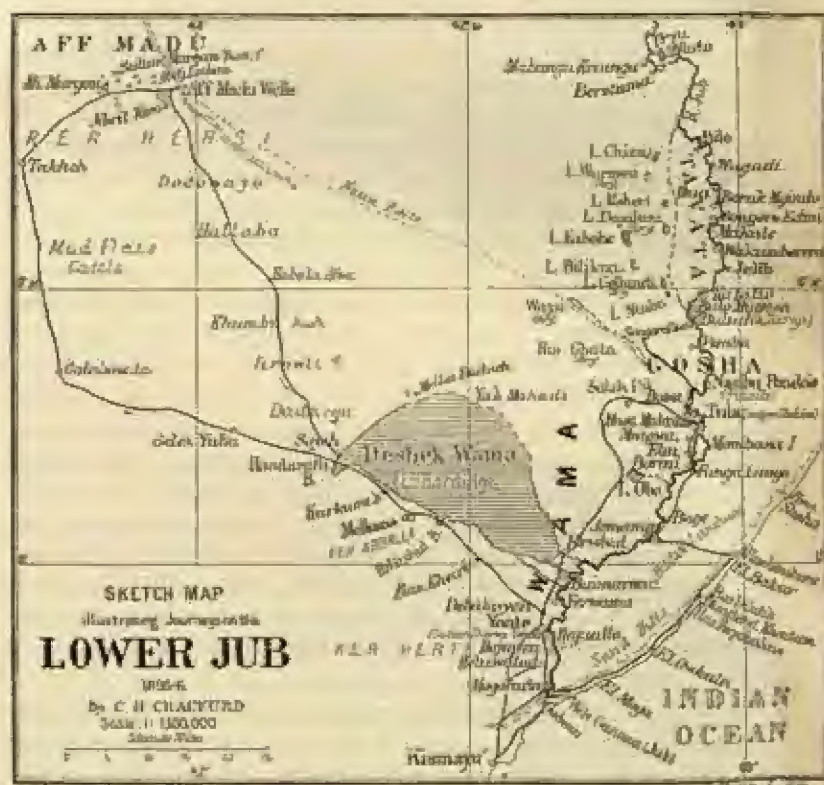
‡ P. 50, above; cf. *J. H. S.*, xvi. 213-214.

§ For the discussion on this paper see vol. viii, p. 472.

|| From a report kindly communicated to the Society by the Foreign Office.

information on the map of East Africa, published by the Society in 1833, and he has proceeded beyond that lake in the direction of the famous wells known as El Wak. Now that friendly relations have been established with tribes so far inland, it is to be hoped that some enterprising traveller will avail himself of this new opening, and penetrate to the Borana country from Kismayu.

Mr. Craufurd left Kismayu on his first visits to Goshu on June 8, 1895, with a caravan of eighty-five persons, two maxims, and fifteen



beasts of burthen (camels and horses). Having crossed the sandhills near the coast, he came upon a wide plain of yellow sand, with occasional patches of red sand, and more or less clay. The vegetation consisted of grass and thorn-bush of mimosa and acacias. Passing through the millet-fields of Hajuwen, and meeting with grazing cattle and goats, he reached Yonta, the residence of Sultan Ismael of the Herti Somal, who seemed inclined to resist the demands made upon him. His village occupies an undulating ridge close to the river Jub. The camp was pitched a little beyond it, at Debakoyen, a famous battle-ground of the clans.

On the 9th the caravan crossed several streams flowing out of the Jub into the Deshek (lake) Wama, and on the 10th it was ferried by Waboni across the Ferishid stream, 60 feet wide.* These Waboni live on fish and game, which they shoot with poisoned arrows. Physically they are much inferior to the Gallas. Their nostrils project like those of a horse. Some of their customs are curious. A duel with knives is fought before the surrender of a bride, and arrows are shot into the sky when rain is desired.

The Deshek Wama, which Mr. Craufurd proposes to name after his chief, Mr. A. H. Hardinge, varies much in size according to the season, covering about 320 square miles in May and June, and again in October and November, when it is largest; whilst in February and March a good part of it is hidden by rushes, and only detached pools are visible.

The route on the 11th led first over grassy plains, and then through thorn-bush to Lake Obo, or Bobo, which lies among big trees, with a fringe of dum-palms, and has excellent clear and sweet water. On the following day the camels and horses were left behind at a small pond called Salch, as the "gandi" fly or tsetse infests the dense bush which here separates the open country from the river Jub. On approaching Songoro Mafula's town (Tula), numerous villages and plantations of maize were passed; Tula itself is a thriving place, with comfortable bell-shaped houses divided by a wall into two apartments. Gosha, of which this is one of the principal villages, is a fertile agricultural district extending for about 50 miles along both banks of the Jub. Mr. Craufurd estimates its population as from 25,000 to 30,000. The inhabitants are warlike, and, besides fighting among themselves, show a bold front to their Somali enemies. Nominally Mohammedans, they nevertheless drink great quantities of spirit, which they distil from maize or millet. Their fields are irrigated by channels derived from the Jub, and the crops are thus independent of the rainfall, as long as the river rises sufficiently.†

From Tula Mr. Craufurd made an excursion in search of the Deshek Ria Ghata, but found merely a dry depression, about 5 miles in length and 300 yards wide. Three years ago, when the Jub rose to an exceptional height, this depression is reported to have been filled with water. Deshek Wayu, about four hours distant, is stated to be in a similar condition. Near the Ria Ghata there is an open grass plain, with a big tree in the centre, where the people of Gosha and the Somali meet to

* Mr. R. G. Farrant, who crossed this river in July, 1896, found it dry, with water in holes.—E. G. R.

† Mr. R. J. Farrant, assistant-collector, who ascended the Jub in 1896 to Mfude, where they build dhow, found thirty large villages between Songoro Mafula's town and Bilo. Tavata Island, between the main branch of the Jub and the Wabi Yero, has a large population, and is very fertile, maize being the principal crop. Coconut palms have recently been introduced, apparently with success.

trade, the former bringing maize, millet, tobacco, and slaves, whilst the Somal offer cattle, goats, donkeys, and slaves.

On a subsequent occasion Mr. Craufurd went to Gosha through the Italian sphere. Having crossed the Jub at Gobwin (Jumba), he travelled by a route lying between a range of high yellow sandhills and the sea, as far as the Bunder el Khadam ("slave port"), a capital little harbour, protected by the headlands of Hayabakus and Dikdik. At El ("well") Bakar he met with Biomal Somal, who owned considerable herds of goats, cattle, and camels. On the following day he crossed the sandhills and then the plain of Bildik Laushune, which showed signs of former cultivation, and reached the Jub at a bluff opposite Jemama. He then went up the river to Funga Lango ("shut the gate"), on the border of Gosha, where the camels had to be left for fear of the tsetse fly.

On November 28, 1895, Mr. Craufurd left Kismayu for the district of Aff Madu, occupied by the Rer Herai, a clan of the Ogaden. Leaving his former route at Debakoyen, he travelled through grass-land with thin bush in a north-easterly direction as far as Melkana, the residence of Sheikh Hassan Bhergin of the Rer Abdalla. The great lake first came in sight at Alan Kheiri ("beautiful leaves"). At Bolez Yaba he was met by messengers from Sultan Murgan Yusuf, who forbade him entering his territories, but this warning was disregarded. The route for two days led over a muddy plain, which a thunderstorm speedily turned into a swamp. At Takhek (December 1) he narrowly escaped an ambush, and on the following day, at noon, he arrived at the sultan's village. This personage, an old man, was not visible, and all business was conducted through the sultan's "prime minister," Sheikh Jibril Fara, whose village was two hours further, on the border of a beautiful meadow of short sweet grass, surrounded by handsome trees, and close to the celebrated wells of Aff Madu ("black lips"). These wells, about twenty in number, occupy the bed of a wadi, said to rise in Lake Lorian. Occasionally a big brown flood comes rolling down its bed, and fills the wells, but when Mr. Craufurd was there their muddy water stood 20 feet below the surface. Four of these wells were dug by the Wordeh Galla,* the remainder by the Ogaden Somal, who drove them out of the country.

Aff Madu contains about one hundred villages, with from 15,000 to 20,000 inhabitants, including a considerable slave population of Gallas, Masai, Wa-Kiknyu, and Wakamba. There are extensive plantations of millet and vegetables.†

The conciliatory conduct of the "prime minister," and the military

* These are Kobaba, or Wajala Galla, known to the Somal as Werra Dai, the original occupants of Wama, who were ousted in 1890 by the Kablala Somal, and now live beyond the Tana, where they are known as Bararata.—E. G. R.

† These wells are not apparently to be identified with El Wak ("God's wells") of my map of 1883.—E. G. R.

display which Mr. Crauford was able to make, prevented a collision, although war-cries were raised and spears were flourished. Tribute was ultimately paid, and during a subsequent visit Mr. Crauford had the satisfaction of receiving the submission of the sultan, "with tribute and every protestation of service and allegiance to her Gracious Majesty."

On December 4 he started homeward, first passing through extensive plantations of millet. He successively crossed Hahala Afwa (open grass) and the Khumbi Bush, and reached the big lake, which had risen in the mean time, at Soyeh. On December 11 he was back at Kismayu.

Summing up his results, Mr. Crauford states that the country as far as lat. 2° N. presents the features of an undulating plain, covered with grass and thorn-bush. Acacias, mimosas, euphorbias, baobabs, and cactus form the vegetation most noticeable, except near the Jub river, where wild date-trees, dum-palms, rushes, reeds, convolvulus, and other creepers abound. Many of the lakes seem to be merely ephemeral. The land presents all the features of an ancient sea-bottom.

The map accompanying this notice is copied from one forwarded by Mr. Crauford, but some information has been added from a map of the Jub prepared by Mr. R. J. Farrant.

LAKE MWERU AND THE LUAPULA DELTA.

By A. BLAIR WATSON, Collector of Revenue, Mweru District.

THE following account of further explorations by Mr. Blair Watson, whose visit to Kilwa island was described in the *Journal* for November, 1895, has been communicated to us by Sir Harry Johnston. Mr. Watson begins by describing a second visit to Kilwa, during which he more thoroughly explored the caves at the north-west end of the island than had been possible on the former occasion, when he had been much hampered by the want of a guide. He says—

"This time I took the old chief himself with me, and explored the caves thoroughly with him as guide. Last time I missed even the best entrance. Passing through a small opening in a wall of rock, which rises at the water's edge a little in front of the cliff, one finds one's self in a cave formed by the overhanging cliff, and from the back of this a fine arched passage runs directly in for 60 or 70 yards, keeping much the same size throughout, 9 or 10 feet high, and about 7 feet wide. Offerings were made by the chief to the 'Mizimu' before we entered their particular chamber (the terminal one), and he was very much in earnest over it. It was the first time that I had seen any of the natives about here take their Mizimu really seriously.

"From Kilwa I returned to Kafwimbe's, at the mouth of Chimbofuma, hitherto my outpost village on the south. Thence I came southwards to Kasamba, which lies at the south end of Chimbofuma. I am encamped

here until the Mwitowa headman, whom I have placed here, has finished building his stockade. Under Kazembe this was an important place—his chief canoe port on the lake, from which its occupation cuts him off, except by the Luapula route, which Kilwa commands.

"On this journey I resumed my exploration of the Luapula, camping on the delta islands forming the south shore of the lake, and exploring from these the various channels entering its south end. On the east bank of the Luapula there are three principal places where the water leaves the main stream to pour over the delta flats at all seasons of the year. When the river is in flood, the banks are submerged for miles. The highest up and most important of these 'escapes' is a little below the point of entrance of the river Mlungusi. This runs to Mofwe lagoon, is fairly open, free from the grassy growth which covers much of the shallow waters of the delta, and affords at all times of the year free communication for canoes between this lagoon and the Luapula. The second is at Chisenga, about 17 miles up, and the third is about 5 miles up at Pa-munga (so called from a dense mass of the thorny 'pith' tree, so common round Mweru shores). Escaping at these points, the waters spread out to the eastward, being bounded by a steeply rising ridge which runs from Chimbofuma to the south end of Mofwe, forming the eastern bank of that lagoon. They are collected and pass into Mweru through four openings to the east of the principal mouth. These are, starting from the east, Chimbofuma, Chontontema, Kapulwe, and Mifimbo.

"The lagoon-like Chimbofuma is well known from Mr. Sharpe's map.* It is about 6 miles long by 4 miles broad, and lies north and south. Its south end is blocked by a dense grassy growth, which is encroaching on the open water. Boats can, however, still pass through this belt into the broad and deep Siki-mtu channel, leading to Chontontema, but in another year or two it will be impassable.

"Between Chimbofuma and Chontontema lies Sokwe island, with the Siki-mtu channel on the south. Chontontema is also lagoon-like, about 4 miles long by $1\frac{1}{2}$ mile broad, narrowing at the mouth to about three-quarters of a mile. Several side channels besides Siki-mtu open into it.

"Mwitowa island lies between Chontontema and the Kapulwe mouth. This is about 80 yards broad; its open water does not extend far now. Until lately these channels afforded free passage for canoes throughout the delta, and between Mofwe, the Luapula, and the lake. Of late years, however, the grass has encroached so much that the direct route from Mofwe to Mweru *via* Chimbofuma or Chontontema is now practically abandoned, and canoes pass into the Luapula by the channel entering nearly opposite the Mlungusi, and thence down the main stream. The mode of progression is by widely forked punting-poles, the fork of which allows considerable pressure to be exercised against the grass-stems.

* *Geographical Journal*, vol. I. p. 376.

Between the Kapulwe and Mifimbo mouths lies a small marshy island. Mifimbo opens about a mile west of Kapulwe; it affords a fairly direct passage into the Luapula at Pa-munga, and is still open enough for canoes to pass, and is still used.

"Sokwe island, nearly 6 miles long, is well raised above the lake-level. It is well timbered, and much of it is covered with very dense bush. It was at one time inhabited and cultivated.

"Mwitowa island, 7 miles long, is generally well above water-level, though marshy in parts. It is also wooded, and has been inhabited. Both it and Sokwe abound in game—Puku, Lechwe, and *Tragelaphus Spekei*. Guinea-fowl are also present, and during this journey a leopard was seen by the men.

"To the west of the principal mouth of the Luapula there are two channels; the Kawongo mouth opens a little to the west of the main stream, and joins it less than a mile up. This is deep and open. The Kauantipa channel opens about a mile to the west of the principal mouth, and joins the main stream nearly opposite Pa-munga. Its Mweru extremity is now closed by grass. Immediately to the west of it, Kisumbu, a narrow rocky peninsula, stretches for a couple of miles north-north-east into the lake. The rock is sandstone, this and the Kilwa sedimentary rocks being probably part of the same formation. West of Kisumbu a broad shallow bay stretches away to the west coast of the lake.

"The country to the west of the lower course of the Luapula is occupied by a vast marsh, the Luongo Mbuga, which extends from the lake-shore almost to the Mlungusi. It is mostly dry in the dry season, but in the wet season is filled from the Luapula, which, when in flood, overflows its banks for miles. Some of the flood waters will thus make their way into the western arm of the lake; but no definite channel seems ever to have existed, and I could not hear that canoes were ever able to make their way into the river from this bay without passing round Kisumbu point.

"The water at the south end of Mweru, except opposite the main stream of the Luapula, is brown in colour, and unpleasant to the taste, from filtering through so much vegetation. The lake has risen very high this wet season, higher than for several years past.

"Several rivers flow into the delta. The Ngona, or Ngwena, on which Kazembe's town is situated, runs its own course in the dry season to the Luapula, which it enters a considerable distance above the Mlungusi. When in flood, however, it fills the swamp which extends between it and the south end of Mofwe, and thus some of its waters will pass into this lagoon; there is no passage for canoes, however."

Mr. Watson concludes by referring to the beneficial effects which have resulted from the defeat of the chief Mlozi, and to the consequent insecure position of the Arabs settled in the We-usi country, where fighting with the natives has been going on for some time.

JOURNEY FROM WESTERN AUSTRALIA TO WARINA, IN SOUTH AUSTRALIA.*

By W. CARR BOYD.

WE have received from Mr. W. Carr Boyd an account of a journey made by him during the latter half of 1895, between Lake Carey, in Western Australia—near the furthest point reached by Forrest (going east) in 1869—and the Warina railway station, on the Northern Railway of South Australia. During this journey a considerable amount of new ground was traversed between the routes of Forrest (1874) and Giles (1875), and west of Lindsay's track in 1891. Mr. Carr Boyd sends us a sketch-map of this section of the route, from which the accompanying map has been prepared.†

The Kalgoorlie gold-fields were left on May 27, 1895, the expedition consisting of Mr. Carr Boyd and Mr. A. Woodhouse, with three camels and a dog, and being supplied with rations for about five months. The Mount Margaret gold-fields, situated close to Lake Carey—the furthest towards the interior yet opened—were soon reached, and a further start was made on June 10. About 25 miles north of Mount Margaret the explorers fell in with some hundreds of men, spread over the country, with horses and camels, in search of indications of gold. They therefore pushed on north-east, across a country covered with sand-hills, spinifex, and thick scrub, to Mount Shenton. Here they were joined by three other men, with three camels and a horse, the remaining prospectors being obliged, by want of provisions, to turn back. The leader proposed to make for the Warburton ranges—on Forrest's route of 1874—and, in case of not finding gold in their neighbourhood, to continue eastwards as far as the trans-continental telegraph line, a distance in all of about 750 miles.

Proceeding eastwards, and passing some ranges of hills and a creek trending north-east, a lake was discovered, and named after Sir Thomas Elder. South-east from this a still larger lake was found, which received the name "Baron von Mueller." Good indications of gold had been met with on the way. The lake was followed eastwards some 25 miles, during which distance it maintained a width of from 1½ to 4 miles, and prevented access to some large ranges seen to the south and south-east. The travellers then struck north-north-east over a high tableland, followed by sand-hills and scrub, and after passing two creeks with "soaks," and seeing ranges of hills on either side of the route, reached a third large lake, which they named Lake Fleming. The Warburton ranges were soon afterwards sighted, and after passing a high mountain

* Map, p. 120.

† The date of Lindsay's journey is given inaccurately in the map. It should be 1891-92, instead of 1882.

at the northern end of a range, from the top of which a view was obtained for miles in every direction, the party struck Sir John Forrest's route at the Barlee Springs, so named by him in 1874. After 90 miles more the South Australian boundary was reached, after which 410 miles in a general south-easterly direction brought the travellers to Coodanooona and Warina. Hardly a trace of white men was seen until within 60 miles of the railway at the latter place.

In Mr. Carr Boyd's opinion, the country between Lake Carey and Barlee Springs, which has been generally regarded as an appalling desert, is well adapted for cattle and horses, mulga and other kinds of bush suitable for fodder abounding. Sheep would probably not thrive, as there is but little grass. All that is needed to render the whole country fit for stock is to bore for water and open up the various "soaks" and springs. Natives were met several times along the route, and from Mount Shenton to within 150 miles of Warina, their fresh tracks were seen daily. The only trouble experienced from them was near the South Australian border, where a solitary "black" attacked Mr. Carr Boyd with his club, notwithstanding all the efforts of the latter to come to an understanding with him. No signs of stone weapons or implements were seen, all being made solely of wood. The natives seen were, unlike all of whom Mr. Carr Boyd had previously had experience, confirmed bone-eaters, grinding down the bones of the animals killed with various seeds, and mixing with a little water before cooking.

Three out of the six camels which accompanied the expedition travelled 510 miles, and went 40 days on only $6\frac{1}{2}$ gallons of water, drinking 3 gallons on the thirty-second day, and $3\frac{1}{2}$ on the fortieth. After the first ten days without water, it was offered to them every morning, but they would not drink. In the hot weather, however, they would have required many times as much. At the time of writing, Mr. Carr Boyd was about to start back for Lake Darlot, in Western Australia, with six months' rations, and, it being the hottest time of the year, would be better able to judge of the country than on the outward journey. The first stage of 120 miles would be entirely without water.

SOUTH-WEST AFRICA IN LANGHANS' COLONIAL ATLAS.*

(From a Correspondent.)

THE maps of a young colony are, in a way, a test by which to measure the progress of the country which they represent. Before South Africa developed gold and diamond mines, nobody seemed to care whether its maps were reliable or not. As it rose in importance and affluence, its

* 'Deutscher Kolonial-Atlas . . . entworfen, bearbeitet und herausgegeben von Paul Langhans.' Gotha: Justus Perthes, 1893-96.

maps increased in number and accuracy, and to-day the position it has attained is faithfully reflected in the care bestowed on its maps and the high finish given them. Twenty-five years ago South-West Africa was practically a desert, and its maps were based upon the journeys of Captains Alexander, Galton, Anderssen, Hahn, and a few others, and recorded little change, except that wrought by a few missionaries pushing further towards the unexplored regions. As civilization spread in South-West Africa, maps became plentiful, but left a good deal to be desired. Their compilers, though careful to record the results of new journeys, retained old and erroneous data, so that the changes and greater amount of detail in the new maps were no guarantee for a corresponding degree of greater reliability.

It is the merit of P. Langhans to have given us, in his German Colonial Atlas, a map of South-West Africa which exactly represents our present knowledge of that country, and may be considered thoroughly reliable in the degree in which that term can be applied to a country where it has as yet been impossible to introduce a uniform general survey. P. Langhans has taken upon himself the task of comparing all available routes, old and modern, and the duly balanced results form the groundwork of his map. No less than forty-seven German travellers, who visited these regions between the years 1805-1897, have thus been made to contribute to the map, not to mention the innumerable host of English explorers, whose routes are given, though their names are not specially mentioned. The map is divided into seven sections, and an equal number of sheets, two of which represent German South-West Africa—one the region round Lake Ngami, and one the whole of South Africa up to about the 18th degree of latitude. In comparing the sheet No. 183 with any other map of the same region, it is surprising to see the progress in our knowledge of the configuration of that country. While the excellent print renders the numerous names, even in smallest type, clearly legible, the delicate colouring of the map makes it pleasant for the eye to dwell upon it, giving at the same time, through its various shades, a general idea of the physical aspect of the country from a botanical point of view; grasslands; tropical vegetation, districts with next to no vegetation, can thus be distinguished at a glance.

It is needless to point out the advantages of this method, especially when applied to a country which has the name of being, if not practically a desert, at least one which affords only the meanest subsistence to a very limited number of inhabitants; a legend which this map is certain to abolish for ever, its shading being based upon the most carefully examined reports.

Numbers of inset maps impart most valuable information. They represent various bays, which might, with the aid of art, be turned into useful harbours; point out districts in which minerals have been found, and show the distribution of the various races which inhabit

South-West Africa. Sheet No. 4 shows two small but accurate maps of British Kafraria and Natal, with a view of proving by their number the success of the various German settlements in these districts. Of special interest are two diagrams showing Windhoek, the seat of government in South-West Africa, and the routes of the Boers during their memorable treks from the Cape Colony to what is now the Free State, Natal, and Transvaal.

Military garrisons, postal routes, post-offices, and lines of projected railways in South-West Africa are clearly illustrated on sheet No. 4, also steamer lines to Europe and seats of German consuls in British territories. Figures near the names of towns or villages show the year, and abbreviated words the cause of their foundation—a circumstance which renders the maps particularly valuable from an historical point of view. If we add that the four sheets, together with two sheets of explanatory and statistical remarks, can be bought for four shillings, which places the map within the reach of almost everybody, we feel that we have said enough to recommend it most strongly to the public, though we have not by any means exhausted what might be said of the merit of this really excellent specimen of cartography. There is no doubt that the map of P. Langhans is at present by far the best map of South Africa produced on the continent.

EXPLORATIONS IN CENTRAL BRAZIL.*

WHETHER or not the Brazilian Constitution had good reasons for changing the political capital of the Republic from Rio de Janeiro to a more central inland region, certain it is that the work of exploration done by the special commission sent to select the locality is of great geographical value. Numerous localities of Brazil—and, it may be added, of all South America—which one sees minutely represented on maps, have, as a matter of fact, never been explored with anything approaching scientific accuracy. The geologist of the present Brazilian Commission (Dr. Hussak) complains of having no trustworthy map on which to lay down his geological surveys.

The country recently explored (in the eastern part of Goyaz, near Minas Geraes) is, geographically, very interesting, being in the centre of what has been justly called "the Brazilian Island," on the very spot from which waters flow into all the important fluvial systems of South America.

The investigation began in the south, at Uteraba (Minas Geraes), and ended in the high valleys of the Tocantins-Araguaya (between 19° and 15° S. lat.) from June (29), 1892, to January, 1893.

* "Commission d'Exploration du Plateau Central du Brésil . . . Par L. Cruls, Chef de la Commission." With atlas. Rio de Janeiro: Lombaerts et Cie., 1894.

Once more it was ascertained that the representation on maps of well-defined, great mountain-chains in Central Brazil has no foundation in fact. The country is formed of very extensive plateaux (*tombadas*, *chapadas*, *chapadões*), occasionally interrupted by isolated *picos*, or rocky crsts, gradually rising from south to north, with a mean altitude of 3000 to 4300 feet between deeply denuded river valleys. The so-called Serra do Albano on das Divisões was found to be, in fact, an instance of this common geographical mistake. Northwards the high valleys of the Tocantins-Araguaya affluents form a very abrupt escarpment (*râos*).

The height of the Pyreneos, or central mountainous group and water-parting of Goyaz, has been diversely estimated by travellers and geographers, by some even supposed to contain the highest summit of all Brazil (P. des Genettes, 9617 feet, or 2932 m.; J. Wells, 9700 feet). M. Cruls was able to settle this doubtful geographical point: the *pico* rises on a *chapadão* of about 4800 feet; their highest summit is 4544 feet (1385 m.) above the sea-level.

The very extensive *chapada* dos Veadeiros, between the two southernmost arms of the Tocantins, is 5100 feet, with *picos* at 5488 and 5505 feet. One mountainous ridge, the Serra Dourada, represents the south-western extremity of the highlands (Serra Geral) which, for a long distance (from the borders of Bahia), are the water-parting between the fluvial systems of Tocantins, São Francisco, and Parahyba-Parana. Serra dos Cristaes, between the rivers São Marcos and Bartholomeu-Corumbá, is really much more to the south than maps show. Many important altitudes were determined (Minas do Abbade, 3274 feet; Pyrenopolis, or Meia Ponte, 2418 feet; Goyaz or Villa Boa, 1903 feet; Brito, 2921).

The valley of the Corumbá, an affluent of the southern system Parahyba-Parana, comes, notwithstanding, from the north of the Pyreneos. The valley of R. das Almas stretches along their south slopes, to be connected afterwards with the northern Urubu-Tocantins system. Several lakes were thoroughly surveyed: Lagoas Mestre d'Armas (Parana), Formosa (or Couros, Tocantins), Feia (São Francisco).

The lake represented on many maps at the head of Ribeirão dos Arrendidos (affluent of R. Preto-São Francisco) does not exist. But two new lakes were discovered and surveyed near the left bank of Rio Preto: Lagoa Grande, on the course of R. Fundo, affluent of the right bank; and L. Formosa (the second), on an affluent of the left bank of R. Bozerra.

From the high valleys of the Tocantins-Maranhão (R. dos Patos, R. Verde) to the high valleys of the Parahyba-Corumbá (rivers Mesquita, Santa Cruz, São Bartholomeu) and São Francisco, R. Preto—one line, north-west to south-east, divides the Paleozoic from the Archaic rocks. Mica-schist forms the vegetation-covered plateaux; Itacolmitite

shapes the highest naked *picos*. The Commission thinks that all the necessary elements for the prosperous revival of the old exploration of gold and diamonds exist in Goyaz.

The meteorological observations were made between August 24 and December 25, during the last part of the dry and the first part of the wet season. October to April is the rainy season. Heavy dew falls during the night, sometimes (every ten years as a rule, 1872-82-92) destroying all vegetation. Mean temp. 84° - 68° Fahr. (alt. 3280 feet); max. (shade, October 10) 92° Fahr. (Corumbá valley); min. 28° Fahr. (July 12, Catalão, 1607 feet alt.). Difference between highest and lowest temperature, 45° Fahr.; mean difference, 23° Fahr. Rain, 1.5 to 3 inches in a day.

The flora of some of the countries visited was studied for the first time (A. Glazion and Ernest Ule), viz. the region between Formosa and Cavalcante. Dr. Ule collected 450 phanerogamic and 350 cryptogamic species, many of them new (*Wunderlichia eruliana*, Pyrenees, etc.). Two new phanerogamic genera were discovered (one Composita, Pyreneos; one Papilionacea, Balisa).

Upon the whole the observations of Dr. Ule seem to corroborate the old geographical classification of Martins and general characterization of Grisebach. Goyaz seems, however, to possess a special flora, with numerous endemic species whose limits cannot yet be determined. The characteristic families are the Velloziaceæ, Melastomaceæ (*Microlicium*), Turneraceæ, Eriocaulaceæ, Vochyseaceæ, Compositæ (*Lychnophora*, *Eremanthus*), Malpighiaceæ (*Camara*, *Pterandra*), Ternstroemiaceæ (*Kielmeyera*). Plants of the Amazonas (*Hylæa*) are nearly connected with some of Goyaz. The *Mauritia armata*, Mart., seems to have here its centre. There are also to be found many plants of the Alpine flora of the Itatia and Orgãos mountains, as well as from the Chile and even Plata. Dr. Ule remarks (after Gardner and others) the extraordinary beauty of the flowers of plants and the puzzling development of their buds and leaves long before the first rains (a fact already observed by Humboldt and Auguste Saint-Hilaire), of which the Brazilian botanist gives a more natural explanation than Grisebach.

The Chapadões are covered with scattered trees (*atingas*, *cerrados*), Gramineæ and Cyperaceæ (*Paspalum*, *Panicum*, *campos*). The rivers are lined with forests (*Buritiyues*: *Mauritia nicifera*, etc.) from their headwaters (*capões*). Large and dense forests are principally to be found towards the west, as the beginning of the immense forest region of Matto Grosso (*Mauritia armata*, etc.). The forests have some of the best woods (*Persea*, *Cedrella*, *Dalbergia*, *Machierina*, etc.). Numerous Sapotaceæ (*gutta-percha*), coffee, manihot, sugar-cane are cultivated. The vine can grow in many localities. The high campos of the Tocantins are very good for wheat-growing. Economic and medicinal plants are plentiful.

All the most important and characteristic animals of Brazil, considered as a geographical region, with the exception of some tropical quadrumana, exist in the countries visited by the Commission. This part of Central Brazil may be considered as now being the principal residence of all the great mammals, less numerous—some of them even very rare—in the other districts of the New Republic. (The black and spotted variety of *Felis onca*, *F. tigris* and *F. jaguarundi*; the red and black variety of *F. concolor*.) It has been pointed out ('*Liais*,' p. 558) long ago, that the twelfth and eighteenth parallels, within which the present exploration took place, marking the intermediary zone between the Amazonian and Plata basins, are the boundary of many animal species.

Among animals of economical importance, the principal are the otters (*Lutra solitaria*, *L. Brasiliensis*), the skunk (*Mephitis mephitis*), the anta or tapir (*Tapirus Americanus*), and the emu or American ostrich (*Rhea Americana*), the latter, however, in decreasing numbers.

Some of the principal latitudes determined were—

Formosa	...	...	...	...	...	...	15° 32' 7"
Mestre d'Armas	...	...	...	...	...	...	15° 27' 38"
Pernambuco (Melo Pente)	...	...	...	...	...	...	13° 51' 45"
Goyaz	...	...	...	...	...	...	15° 55' 20"
Bomfim	...	...	...	...	...	...	16° 40' 7"
Entre Rios	...	...	...	...	...	...	17° 43' 40"
Catalão	...	...	...	...	...	...	18° 10' 23"
Santa Rita do Paranaíba	...	...	...	...	...	...	18° 28' 27"

THE GEOGRAPHY OF MAMMALS.*

By W. L. SCLATER, M.A., F.Z.S.

No. VI.—THE NEARCTIC REGION.

SECT. I.—BOUNDARIES OF THE NEARCTIC REGION.

With the Nearctic Region we enter upon a subject on which there has been considerable controversy among the students of geographical distribution. As was pointed out in the introductory article of this series, a certain number of writers maintain that this Region does not contain a sufficient quantity of distinctive and indigenous forms to entitle it to separation from the Palearctic Region. What should constitute a sufficient number of distinctive forms depends, of course, largely on the individual opinions of the writers, but if allowance be made for the undoubted similarities of the extreme northern parts of the Old and New Worlds, which together may be considered as forming a kind of intermediate district, the facts and figures given below will, I think, convince every one that the land-surfaces of the Palearctic and Nearctic Regions have now, and have had in the past, quite sufficiently distinct faunas to warrant their division into two primary Regions.

The boundaries of the Nearctic Region are comparatively simple. On the north, the line of the extreme limit of trees may be taken, beyond which the so-called

* Continued from vol. viii. p. 389. Map, p. 120.

"barren grounds," together with a similar district in the Old World, may form an Arctic intermediate district as mentioned above. South of the barren grounds, the Nearctic Region will include within its boundaries the whole of North America as far as the southern limit of the tableland of Mexico, in the neighbourhood of the city of that name. On either side of the tableland the Neotropical Region extends as a narrow strip along the Gulf of Mexico and the Pacific, as far north as the Rio Grande on the former coast, and to about Guaymas on the latter.

There are no islands of any importance belonging to this Region that need be mentioned here. The Pacific islands on the west coast of Mexico have few, if any, mammals. The large islands of Newfoundland and Vancouver are of the true continental type, being separated from the main land only by quite shallow water. The Antilles, or West India islands, belong entirely to the Neotropical Region, and have been already considered in a previous article.

SECT. 2.—GENERAL VIEW OF THE MAMMAL-FAUNA OF THE NEARCTIC REGION.

On referring to the table given at the end of the first article of this series,* it will be seen that the total number of genera, and also of species contained in the Nearctic Region, is considerably less than in any of the other Regions hitherto treated of. This may be explained partly by the fact that practically the whole of this Region is outside the tropics, whereas the other Regions previously described lie to a great extent within the tropical zone, which is very favourable to the development of a rich and varied fauna.

Out of the nine orders into which the terrestrial mammals have been divided, two only are not represented in this Region. These are the primates, at the head of the list, and the monotremes, at the extreme end, the latter being confined to the Australian Region. The marsupials are represented by one species only, the well-known Virginian opossum, which is found with very slight modifications from the Southern States of the Union southwards over the greater part of South America. This animal would, perhaps, judging merely by the present distribution of life, be considered to have intruded into the Nearctic Region from South America, where alone members of this family still survive; but, on examining its past history, we find that the genus *Didelphys* was formerly found both in Europe and in North America during Eocene and Miocene times, so that it is quite possible that the Virginian opossum may be a survivor rather than an intruder in North America.

The next order, the edentates, is represented in this Region only by a single species of armadillo (*Tatusia normaniensis*), which almost certainly came up from the south, and is only met with just inside the southern borders.

Among the ungulates, the most remarkable form is the prong-buck (*Antilocapra*), which forms a distinct family of that order, and is entirely confined to this Region. It is allied in some respects to the antelopes of the Old World, but it is unique among all the hollow-horned ruminants from the fact that it sheds its horns every year.

Two other genera belonging to the family Bovidae are confined to the Nearctic Region; these are the Rocky mountain goat (*Haploceros*), found only in the Rocky mountains; and the musk ox (*Ovibos*), which ranges over the barren grounds at the extreme north of the continent, and spreads into Greenland. The latter, however, was found in the northern parts of the Old World until a comparatively recent epoch, geologically speaking.

Rodents are very numerous in the Nearctic Region. According to the tables here used, which have been compiled from Flower and Lydekker's text-book of

* *Geographical Journal*, vol. iii. p. 104.

mammals, out of a total number of twenty-eight genera, thirteen are endemic. One of these, *Hoplostodon*, a small animal resembling the prairie dog in its habits, and found only west of the Rocky mountains, forms a distinct family.

The Carnivora are also well represented, especially the genera of cats, dogs, bears, and weasels, all of which, however, are widely spread. The only endemic genus is that formed for the reception of the American badger (*Taxidea*), which differs from its European ally in certain anatomical features.

In contradistinction to the Neotropical Region, the Insectivora are abundant in Nearctica; there are no less than four genera of moles met with, three of which are peculiar.

Finally, the bats are neither very numerous nor of great importance; only one genus (*Astrotus*), containing one species, being peculiar out of a total of nine.

Summarizing, therefore, we find the Nearctic Region to be characterized by the exclusive possession of only two families of mammals—namely, Antilocapridæ (the prong-bucks) and Haplodontidæ (the haplodonts), and by the presence of sixty-six genera, of which twenty-one are restricted within its boundaries. On the other hand, in addition to the two orders already mentioned, monotremes and primates, the following important families are absent in the Nearctic Region, although fairly well spread over the Old World:—

Suidæ (wild pigs).	Hyenidæ (hyenas).
Equidæ (horses).	Erinaceidæ (hedgehogs).
Myxidæ (dormice).	Pteropodidæ (fruit-eating bats).
Viverridæ (civets).	Rhinolophidæ (leaf-nosed bats).

That some of these families did, however, at one time exist on the North American continent has been shown by recent palæontological discoveries.

SECT. 3.—ON THE DIVISION OF THE NEARCTIC REALM INTO SUBREGIONS.

The recent work of American naturalists, more especially that of Merriam (2) and of Allen (1), has greatly increased our knowledge of the mammals of North America and of their distribution. These naturalists have further shown that the subregions adopted by Wallace in his well-known text-book on geographical distribution are not altogether supported by the facts now known to us.

Mr. Allen, in his paper on the distribution of North American mammals, first of all excludes from what he terms the North American Region the extreme northern parts of that continent. He considers that the Arctic portion of that continent, namely, that beyond the limit of arboreal vegetation, forms, together with the similar part of the Old World, a separate Region, or, as he terms it, "the Arctic Realm."

Furthermore, the southern part of North America south of the Mexican table-land, together with the lowlying country of Mexico on either flank, he assigns to the American Tropical Realm. The remainder of the continent, combined with the great mass of Europe and Asia, forms, according to this author, the North Temperate Realm. This scheme of division does not differ essentially from that of Mr. Allen. The Arctic portion of North America forms, no doubt, as Mr. Allen puts it, "part of a homogeneous hyperborean faunal area of circumpolar distribution."

Mr. Allen's American Tropical Realm has already been treated of in the third article of this series dealing with the Neotropical Region. There remains, therefore, Mr. Allen's North American Region, which nearly corresponds to the Nearctic Region of our scheme of classification. Mr. Allen divides his North American Region into two subregions—the Cold Temperate and the Warm Temperate, the

two latter falling into two provinces, a Humid or Eastern and an Arid or Western. Proceeding further, he divides the Humid Province into two subprovinces, namely, an Apalachian or Northern and an Austro-riparian or Southern. The Arid or Western Province is also separated into two subprovinces—the Campestrian or Northern and the Sonoran or Southern, and, besides this, the subprovinces are divided into various minor divisions termed districts and faunas.

It will be sufficient for our present purpose to divide the North American or Nearctic Region into three subregions; these may be termed, (1) the Canadian Subregion, (2) the Humid Subregion, and (3) the Arid Subregion.

Mr. Wallace has recognized four subregions in the Nearctic Region. His Canadian Subregion corresponds fairly well to the Canadian or North Temperate of Mr. Allen, except for the fact that it has not been made by Mr. Wallace to extend southward down the mountain ranges. The Alleghany Subregion of Mr. Wallace, again, practically corresponds to the "Humid" of Mr. Allen. The two others, the Rocky mountain and Californian, correspond to Mr. Allen's "Arid," the Californian Subregion being composed of the narrow strip of coast country between the Sierra Nevada and the sea, and extending from Queen Charlotte's sound in the north to the south-western corner of California. The differences, therefore, between Mr. Wallace's and Mr. Allen's views are not so fundamental as one would gather from the critical remarks of the latter author.

The boundaries of the subregions here adopted will be best understood by reference to the accompanying map (p. 120).

The Canadian or Cold Temperate Subregion is bounded on the north by the northern limit of trees which runs through Newfoundland and Labrador, and thence, in an irregular line, trending rather northward to Alaska. The southern limit of the subregion commences, on the Atlantic side, on the coast of Maine, in the neighbourhood of Augusta, and thence runs to Quebec and through the Great lakes. Further west it is bounded by the northern branch of the Saskatchewan, and ends on the Pacific coast in the neighbourhood of Queen Charlotte's sound. But long prolongations of this subregion extend down the Alleghany mountains; in the east as far as Georgia, along the Rocky mountains as far as the Rio Grande, and along the Cascade and Sierra Nevada mountains as far as the Colorado river. Besides these, there are several smaller detached portions of other mountain ranges, which must be attributed to the Canadian Subregion.

The "Humid" or Eastern Subregion is separated from the "Arid" or Western by a line running roughly along the meridian of 100° west of Greenwich, and extending from Manitoba to the mouth of the Rio Grande del Norte.

Passing over, for the present, the Arctic portion, which will be considered along with the similar part of the Old World, the three subregions may now be dealt with individually.

SECT. 4. THE CANADIAN OR COLD TEMPERATE SUBREGION.

The Canadian Subregion is especially remarkable for a number of genera which are common to it and the northern part of the Old World, but which do not extend southwards into the other subregions to be presently treated of. It is further characterized by the small number of genera which are essentially New World forms, and have no connection with the Old World. Reviewing the mammals in detail, we find that the subregion contains no representative of either marsupials or edentates. On the other hand, there are six genera of the ungulates within its limits—a far larger proportion than that found in the other subregions. Of these the only one endemic is *Haploceros* (the Rocky-mountain goat). This somewhat isolated ruminant has its nearest allies in the

genus *Nemorhus*, of the mountains of Asia; which occurs in Japan (*N. eripus*), but of which the best-known form is commonly designated the "serow" by the sportsmen of the Himalayas. There are also no less than four genera found in the Old World, and also in the Canadian Subregion, which do not extend further south. These are *Cervus*, containing the wapiti (*C. canadensis*), closely allied to the red deer of the Old World; the caribou (*Rangifer*), which cannot be distinguished from the reindeer of the northern part of the Palearctic Region; and the moose (*Alces americanus*), which has the same distribution as the reindeer, but is known in Europe under the name of "elk." Besides these, there are two Canadian genera of this order which are found in other subregions as well as in the Old World, namely, the ox (*Bos*) and the sheep (*Ovis*). *Bos*, of which the American representative is the so-called buffalo (now, alas! nearly extinct), is closely allied to the European bison, still found in certain parts of the Old World; while the big-horn (*Ovis canadensis*) is a representative of the wild sheep, which are extensively distributed in the Palearctic Region. The number of genera of rodents of the Canadian Subregion amounts in all to eighteen, of which three are peculiar. One of these is *Haptodon*, to which allusion has already been made; the others are *Peromyscus*, a small genus of rats, and *Erethizon*, which contains only the tree-porcupine of the Canadian forests. Among the members of this order, too, we find three genera common to this subregion and the Old World, which do not extend further south. These are *Myodes* (*M. obesus*), which is represented in Europe by an allied species, the well-known lemming of Scandinavia; *Cuniculus*, a form nearly allied to the lemming; and *Lagomys*, the "pika," or tailless hare, which is found in the higher mountain ranges of both the Old and the New World.

The Carnivora do not present many features of special interest. Two genera—*Mustela*, containing the weasels, and *Gulo*, the gulo, have much the same circumpolar distribution as has been already remarked on in the case of the deer and the lemming.

The number of genera of Insectivora and Chiroptera in the Canadian Subregion is insignificant, and they are of no interest from a distributional point of view.

Viewing the fauna of the Canadian Subregion as a whole, it will thus be seen that its greatest point of interest is its resemblance to that of the more northerly parts of the Old World. This, of course, may be easily accounted for when we recollect that the sea of Behring straits is quite shallow, and in places not more than about 20 miles in breadth. There can be no doubt that there was a land-connection between Siberia and Alaska in comparatively recent geological times, and that this has resulted in the commingling of the faunas of the northern parts of these two Regions, to a considerable extent. This land-bridge must have existed so recently that there has not yet been even time for, in some cases, the animals to become differentiated into appreciable species, as in the cases, for example, of the reindeer and elk.

Below will be found a summary of the genera of the Canadian Subregion, forty in number, which are divided into five categories much in the same fashion as has been done in the previous articles, namely—

1. *Endemic*—those found only in the Canadian Subregion.
2. *Neartic*—those not found beyond the limits of the Nearctic Region.
3. *Neogran*—those found in the New, but not in the Old World.
4. *Arctic and Palearctic*—those which are found in the Old World, and only in the Canadian Subregion of the New; and, finally—
5. *Neogran and Palearctic*—containing the most widely distributed forms.

	Ungu- lata.	Ro- dentia.	Carni- vora.	Insecti- vora.	Chiro- ptera.	Total.
1. Endemic	1	3	0	0	0	4
2. Nearctic	0	3	1	1	0	5
3. Neogean	0	0	2	0	1	3
4. Arctic and Palearctic ...	4	3	2	0	0	9
5. Neogean and Palearctic	1	0	6	1	2	10
Total	6	18	11	2	3	40

SECT. 5.—THE ARID OR WESTERN SUBREGION.

This subregion is, on the whole, the richest of the three, both as regards the total number of genera found within its limits and also as regards the number of genera peculiar to it, which amounts to seven out of fifty-three, as compared with four out of forty in the Canadian, and one out of forty in the Humid.

The Arid Subregion shares with the Humid the only representative of the marsupials found in North America, the Virginian opossum. Just extending, too, to within its limits occurs the only member of the order Edentata, the nine-banded armadillo (*Tatusia novemcincta*). Among the ungulates, the prong-buck (*Antilocapra*) is restricted to this subregion, and the genus *Cervus* of the Cold Temperate Subregion is replaced by the purely American genus *Corvus*, of which the black-tailed deer is the representative.

This subregion is also more particularly the home of the American bison, which, however, ranged even in historic times eastward to the Atlantic seaboard. Among the rodents there are no less than five endemic genera, of which, perhaps, the best known is *Cynomys*, the prairie dog. The other endemic genera all belong to the family *Geomys*, which contains a number of small rodents known as pocket-gophers.

Among the Carnivora there are no genera in the Arid Subregion which are not more or less widely distributed, the greater number of them, both in the case of this order and of the last, being also found in the Old World. Three genera of moles belonging to the next order, Insectivora, though confined to North America, extend into the Humid Subregion. The bats of the Arid Subregion include among their members two genera (each with one species) which occur only in California, while four other genera are found only in the New World. One of these, *Otopterus*, is of special interest, since it is the only member of a very large and well-marked family (*Phyllostomatidae*), which extends into the Nearctic Region from South America.

This subregion, as compared with the Canadian, contains a far larger proportion of Neotropical genera, and, in addition, is characterized by the absence of a number of the Palearctic forms found only in the Canadian Subregion. Such, for instance, are *Rangifer* (the reindeer), *Alces* (the elk), *Ovis* (the sheep), *Haploceros* (the mountain goat), *Ovis* (the gnu), and many others.

The following table, which gives a summary of the genera of this subregion, differs only from the summary of the Canadian Subregion in the omission of the heading "Arctic and Palearctic," since practically all the genera common to this subregion and the Palearctic Region are also found in the Canadian Subregion.

	Marsu- pials.	Eden- tata.	Unga- lates.	Ro- dentia.	Carni- vora.	Insecti- vora.	Chiro- ptera.	Total.
Endemic	0	0	1	4	0	0	2	7
Nearctic	0	0	0	5	1	3	0	9
Neogean	1	1	2	3	5	0	4	16
Neogean and Palaogean ...	0	0	1	9	6	2	3	21
Total	1	1	4	21	12	5	9	53

SECT. 6.—THE HUMID OR EASTERN SUBREGION.

So far as peculiar forms go, the Humid Subregion is quite the least peculiar of the three. It contains only one genus strictly confined within its limits; this is *Neotiber*, with a single species commonly known as the "round-tailed musk-rat." This rodent is found only in Florida, and is much less completely aquatic in its habits than the true musk-rat (*Fiber*), which is spread over the rest of North America.

Taking the orders *seriatim*, the marsupials are represented by the widely spread Virginian opossum; but the edentates do not reach the region at all. Of the ungulates only the genus *Caribæus* (the Virginian deer) occurs, the bison (though formerly inhabiting this subregion) not having been seen east of the Mississippi for the last forty or fifty years.

The rodents, as in the other subregions, make up the great mass of the mammalian genera, numbering seventeen in all, including *Neotiber*.

The Carnivora, Insectivora, and Bats do not differ very markedly from those of the Arid Subregion.

On the whole the Humid Subregion is not a very well-marked division; it differs from the North Temperate chiefly in the non-existence of the numerous northern Palaogean types found there, and from the Arid Subregion in the absence of a good many characteristic desert-haunting forms, and also of several of the South American genera, which have spread up northwards from the Nearctic Region into the Arid Subregion, but which have not reached the more distant Humid.

The following table gives a summary of the genera of this subregion, from which it will be seen that the total number (forty) of genera is markedly less than the corresponding number in the Arid Subregion.

	Marsu- pials.	Unga- lates.	Ro- dentia.	Carni- vora.	Insecti- vora.	Chiro- ptera.	Total.
Endemic	0	0	1	0	0	0	1
Nearctic	0	0	5	1	3	0	9
Neogean	1	2	2	3	1	2	11
Neogean and Palaogean ...	0	0	9	5	1	4	19
Total	1	2	17	9	5	6	49

SECT. 7.—THE PAST HISTORY OF THE NEARCTIC REGION.

During the last twenty years the wonderful discoveries of American Palæontologists have thrown a flood of light, not only on the past history of the Nearctic Region, but also on the evolution of many of the mammalian groups themselves. It is, therefore, very necessary, when reviewing the geographical distribution of the

present mammalian fauna, to shortly recapitulate the more important results and conclusions arrived at from their writings.

A very useful and comprehensive summary of this work will be found in a paper by Professor Zittel, (3) lately published in the *Geological Magazine*. The beds which contain the remarkably perfect remains above alluded to are found only in the western part of North America. Here, apparently, there existed throughout the Tertiary Epoch a series of great fresh-water lakes, on the sides and the bottoms of which were formed an almost continuous series of deposits with the remains of the animals of the surrounding districts embedded in them. The great interest of these discoveries lies in the fact that we can here trace the gradual formation and evolution of several of the mammalian orders as they at present exist. In the oldest beds the mammals resemble one another so closely that it is often impossible to assign them very definitely to any of the existing orders, although the germs of the commencing distinctive characters can even here be traced.

In the later horizons the various groups gradually differentiate themselves, until in the most modern of the deposits the genera can all be definitely assigned to existing orders.

The earliest mammals that have been found in North America come from the Trias of North Carolina, but neither these nor any of the other mammalian remains of the Secondary Period tend to assist the geographical problems involved or are of importance in the present juncture.

With the oldest Tertiary beds an entirely new fauna appears, and furnishes us with remains of forms belonging to various orders of which no traces can be found in the earlier Secondary deposits. The following is a short list of these deposits, together with their European equivalents so far as they can be ascertained:—

LOWER EOCENE	{ Puerco beds of New Mexico. Wasatch beds of Wyoming, Utah, and New Mexico
MID-EOCENE	Bridger beds of Wyoming.
UPPER EOCENE	Uintah beds of Utah and Wyoming.
LOWER MIOCENE	White-river beds of Nebraska, Dakota, Colorado, and Wyoming.
MID-MIOCENE	John-Day beds of Oregon, Nevada, and Washington.
PLIOCENE	Loup-Fork beds of Nebraska, Colorado, Wyoming, Kansas, and New Mexico.
LATE PLIOCENE	Equus beds of Western and South-Western States, and Megalonyx beds of Eastern States.

In the lowest Eocene beds, not only the genera, but even the orders of mammals are in almost every case different from those at present existing. The greater number of these belong to two orders—Cœdontia and Condylarthra; the former the progenitors of modern Carnivora, the latter of the existing Ungulata. These two, and indeed the other orders to which the mammals of this fauna have been assigned, all show considerable points of resemblance to one another, first in the possession of five toes on both limbs, which are provided with neither claws nor hoofs, but with a structure somewhat intermediate between the two, and, secondly, in their extremely small cerebral cavity. A similar, though much more incomplete, fauna has been found in certain beds of a corresponding age in Europe, the genera of their fossil mammals being in most cases identical with those of the Nearctic Region.

In the next stage, the Wasatch beds, which correspond in age nearly to the London Clay of England, a further development of the same fauna is found, with, however, the commencement of certain of the modern orders; such, for instance, as the Perissodactyla (or odd-toed ungulates), the rodents, the insectivores, and the

lemura. Here, too, so far as the scanty remains found in Europe allow us to form a comparison, there is a close similarity between the faunas of the two regions.

In the succeeding 'Bridger beds' of Mid-Eocene age is found the earliest evidence of the still surviving genus *Didelphys* (the opossum). Here also marine mammals and Chiroptera appear for the first time. But any comparison of these remains with European forms is even more difficult than in the last case, owing to the scarcity of such fossils in beds of the same age in Europe.

With the Uintah beds of the Upper Eocene we first begin to find very distinct traces of differentiation between the European and the North American faunas, although a good many of genera met with are still common to the two Regions.

A great advance is found in the fauna of the White-river beds of Miocene age. In this case the mammals can almost all be referred to existing orders, but comparatively few of the genera are common to the Old and New Worlds; and it appears that, whilst during the older Eocene there was a considerable emigration of New World forms into Europe, in Miocene times the stream was reversed, and North America received the greater number of its immigrants from this side of the Atlantic. This immigration continued during the Middle Miocene epoch, the fauna of which has been well preserved in the John-Day beds of the extreme west. At the same time many endemic families and forms are also met with, especially as regards the early predecessors of the camel family, which apparently had its origin and early development in the Nearctic Region, though now entirely absent from it. In the John-Day beds we also find, for the first time, remains of the modern genera, *Rhinoceros*, *Sciurus*, *Hesperomys*, and *Lepus*.

The succeeding "Loup-Fork beds" contain additional recent genera, some of which, such as *Equus* and *Canis*, are now no longer found in the Nearctic Region, while others, such as *Canis*, *Mustela*, and *Lutra*, still remain there. On the whole, however, the fauna of this epoch is still further removed from that of the corresponding period of the Old World than that of the preceding.

A little later, in the so-called "Equus beds" of the Western States, and in the contemporaneous "Megalonyx beds" of the Eastern, we first find a number of neotropical forms, such as *Mylodon* (a gigantic sloth), *Glyptodon* (the gigantic armadillo), *Hydrochirus* (the capybara), and *Torodon*, a member of a peculiar extinct family of ungulates.

The occurrence of all these animals indubitably proves that now for the first time a connection had been formed between the continents of North and South America. Before this epoch, no trace of a Neotropical admixture can be anywhere detected in the Nearctic mammal-fauna.

Thus the evidence of Palæontology in every way supports the deductions drawn from a study of the distribution of recent forms, namely, that the bulk of the present Nearctic fauna has been mainly derived from the Old World, although at times the Region has been sufficiently isolated and sufficiently extensive for the independent evolution of its own characteristic forms. In accordance with these deductions, the present remaining inhabitants of the Nearctic Region may be divided into three categories, as follows: (1) The Endemic fauna, the bulk of which has had, at some considerably remote geological period, a common origin with that of the Palearctic Region, although it has enjoyed ample time to develop and differentiate itself on its own lines. (2) A Neotropical constituent, which first appeared in the Nearctic Region in Pliocene times. (3) A comparatively modern Palearctic fragment, in which not only the genera, but frequently the species, are identical in both Regions. This portion of the fauna has probably reached the Nearctic Region by the passage which must have existed in comparatively modern times across Behring straits. Consequently, while the Neotropical element is

the stronger in the south, this last, the Palaearctic element, is far more prevalent in the extreme north.

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ON THE DISTRIBUTION OF TOWNS AND VILLAGES IN ENGLAND.

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L. PHYSICAL ASPECTS OF THE QUESTION.

THE subject of which I propose to treat in the present paper has points of interest under two aspects—first, with reference to the physical features of the country, and, second, with reference to historical conditions. These two aspects cannot be kept wholly distinct, for at all times physical conditions have to be taken into consideration, and in various ways historical development gives at different times a different value to physical features. Still, it is convenient to consider the subject under each of these aspects separately, so far as that can be done. In the physical aspect of the question, geological conditions must be taken into account, both on account of their direct effect and on account of their indirect effect on town and village distribution through the influence they have had on topographical features. In this aspect of the question, the distribution of villages as well as towns will in a large measure engage our attention, whereas in the historical aspect it is chiefly towns that present such points of interest as it will be possible to take notice of in a brief handling of the subject—such, for example, as the permanence and impermanence of towns, their rise and decay or changes in relative importance, the late origin of towns now of considerable importance in widely different situations, the loss of manufactures by some towns, and their long retention under varying conditions by others.

In examining the subject first under the physical aspect, it may nevertheless be well to take an historical fact as determining the point from which we start, the fact, namely, that most English villages at least bear names of an origin which it is on the whole most convenient to call Anglo-Saxon, or, if not Anglo-Saxon, at any rate Teutonic, and among Teutonic names the Anglo-Saxon comes first. We will begin accordingly with the region first settled by those invaders. As is known to every one, the Anglo-Saxon settlements spread inland from various points on the east and south coasts, more particularly the coasts south of the Wash and east of Southampton Water; and for centuries, and indeed down to a comparatively recent period, this area remained beyond comparison the richest and most populous in the country. Now, it is of the highest importance, with reference both to the physical features and the distribution of towns and villages, that in this area a single geological formation, remarkably uniform in structure, occupies a greater extent of ground than any other formation of uniform character in the country. This, of course, is the Chalk. From Hunstanton point to Weybourne, on the north

coast of Norfolk, a straight line of chalk cliffs sinks down either to the sea or a thin strip of alluvium lies between the cliffs and the shore. From this line the north-east chalk extends uninterruptedly, in a band of varying width, south-westwards to the west of Dorset, reaching the coast to the east of Molecombe Regle. It likewise throws out two branches to the east from Hampshire, running through Kent and Sussex, and forming the North and South Downs. There are thus in all four branches of chalk proceeding from a large central area in Wilts and Hants, and enclosing three wedges of different formation. Two of these wedges are occupied by later (Tertiary) formations, one an acute-angled wedge, chiefly in the basin of the Thames; the other an obtuse-angled wedge, on both sides of Southampton Water. The middle wedge, forming the Weald in the wider application of that name, is composed of members of the Cretaceous system older than the Chalk. East of the northern part of this chalk area there is a band of Tertiary rocks of later date than the two Tertiary wedges already referred to. Apart from recent superficial and marginal deposits, such is, roughly speaking, the geological structure of the area which it is convenient to examine first.

The influence of the Chalk on the physical features of the country is due to the texture of the rock and its situation with respect to neighbouring formations. Chalk is a substance at once recognizable even by those who are not geologists, and its composition is known to every one. The surface features due to its presence are nearly everywhere gentle in outline, but quite distinctive. Though soft, chalk is generally of a firmer texture and less liable to erosion than the rocks immediately adjoining. In most places, accordingly, it forms relatively high ground, and sinks down more or less gradually to the surfaces formed by adjoining formations. The nature of the slope, however, is determined by the general character of the chalk itself. Being soft, its superficial erosion is easy compared with that of most solid rocks. Moreover, like other limestones, it is slowly soluble in rain-water, and, being highly porous and absorbent, it is liable to this form of erosion not merely, like the harder limestones, along cracks and in cavities in which the rain-water is retained in greater or less quantity, but uniformly over the whole surface as far as the rain-water penetrates. The erosion of the chalk is hence fairly equal over the whole surface, and its slopes are for the most part gentle, hardly anywhere so steep that one cannot walk up them.

Where the chalk is exposed on the surface, it generally yields only a thin soil suitable for little else than sheep-walks; but there are large areas over which there are recent superficial coverings affording a sufficient depth of soil for tillage. North of the Thames this covering is for the most part due to glacial deposits, and takes the form of boulder clay. With reference to the cultivation of the soil thus covered, it is an important consideration that the subjacent chalk supplies abundance of lime for the lightening and enrichment of the stiff clay. South of the Thames the superficial deposits, though in places considerable, are less extensive; but in these parts they take the form of clays, loams, and brick-earths, derived either from the degradation of superficial layers of chalk itself or later deposits.

Important as these deposits are with respect to the utilization of the soil for agriculture, it is no less important that they are generally not deep enough to favour the formation of marshes or dense forests, which in Roman times and long after continued to be the principal obstacles to the extension of settlement in England. Such trees as could grow above the chalk were mostly those which could spread their roots over a thin soil, like firs, and were accordingly easily destroyed. Hence, at the time of the Anglo-Saxon settlements the greater part of the chalk areas were probably already cleared, even when they may have been previously forest-land.

The nature of the chalk area is further of importance in another respect.

Much has been said of the difficulty of communication owing to the badness of the roads in England in early times; but, altogether apart from the fact that the state of the roads has varied at different times, it is to be borne in mind that the character of the roads must always be greatly affected by the nature of the surface. Even at a time when roads were at their worst, it would be a great mistake to generalize as to their condition from descriptions of particular roads in regions covered to a great depth with a stiff tenacious clay such as we are familiar with round London. All those who are acquainted with roads on chalk downs where the chalk is exposed on the surface are aware that mere tracks on such a foundation are often better roads than ill-made or ill-kept roads on beds of another nature. And even where the chalk is covered with later deposits, it is much easier to make a good road by getting down to a solid foundation in chalk areas, than in those in which it is quite impracticable to get to the bottom of a clay or clayey loam. All the more easy is it on account of one characteristic of the chalk areas which has an important bearing in the exact distribution of towns and villages.

From its absorbent nature the chalk always contains much water, but does not give it out freely. But whenever this formation spreads over wide areas, its surface, whether covered by later deposits or not, is everywhere streaked with shallow furrows marking the lines of denudation. In some cases these furrows contain at their bottom rivers or tiny rivulets, in many other cases not, but in all of them water is to be found at their bottom. Hence, also, in these furrows are mostly to be found the villages on the Chalk, and their course is frequently marked out by strings of villages. Where there is a superficial covering over the general area, these furrows mostly run right down to the chalk, or to a narrow bed in which the chalk is covered only by a thin deposit of alluvium or river-gravel. In other furrows, accordingly, good roads can easily be made, even in regions where, on the higher grounds, they are apt to be heavy and miry. In the neighbourhood of London, the lines marked out by the course of the Gade contains the villages of Hemel Hempstead, Dulbourne, and Great Berkhamstead, a route now partly followed by the main line of the London and North-Western Railway; that of the Chess has the villages of Chesham, Plaunden, and Rickmansworth; that of the Misbourne has Great and Little Missenden, Amersham, Chalfont, St. Giles and St. Peter, and Denham, a route partly followed by the Aylesbury branch of the Metropolitan Railway; and that of the Rye has West Wycombe, High Wycombe, and Woburn on the Great Western Railway.

While strings of small villages occupy these furrows, villages of greater importance and small towns are sometimes met with at the junction of two such furrows. High Wycombe, for example, occupies a point in the valley of the Rye where it is joined by another gravel-filled cutting from the north: Wilton, the original county town of Wiltshire, at the junction of the furrows traversed by the Willy and the Nadder. A higher degree of "nodality," to use Mr. Mackinder's term, is found where several such furrows meet to form a well-marked though by no means deep hollow; and in such hollows lie Hitchin in Hertfordshire, and Royaton on the borders of Cambridgeshire and Herts, both on the route of the Icknield Way, and many places in Norfolk and Suffolk, Hampshire and Wilts.

For the same reason that strings of villages are met with in furrows on the surface of the chalk, they are to be found at the base of the chalk, either on the chalk itself or on the margin of adjoining formations. In such situations, indeed, the villages are frequently much closer set, and individually more important, than those on the surface of the chalk. Many of these lie on the Upper Greensand, which is mostly a water-bearing formation, and in some places, more particularly in the Weald, yields a remarkably fertile soil, rich in soluble silica, and hence particularly well adapted for the growth of wheat.

In the north-west of Norfolk the western base of the Chalk is accurately marked by a line of villages, from Castle Rising to Snettisham, situated on what is known as the Barstone Sand, an earlier Cretaceous formation. From Inkpen in the south-west of Berkshire, through the north of Hampshire and Surrey and West Kent to Greenwich, where the Chalk reaches the river, the margin of the Chalk and the Lower London Tertiaries is marked by a continuous line of towns and villages. Outside of the area to which we have so far confined our attention, the eastern base of the Chalk in Lincolnshire is marked by a line of villages winding on the whole south-south-east, from South Ferriby on the Humber west of Barton to the neighbourhood of Market Rasen; and in the North Riding of Yorkshire, the north base of the Chalk elicits to the south of Derwentdale or the Vale of Pickering is accurately marked by a close-set line of villages along the road—a little south of the railway—from New Malton to Filey.

Where from any cause a gap exists running through the Chalk, obviously the village which lies at that gap at the base of the Chalk tends to be a point of convergence for roads leading to the gap. The "nodality" of the point rises to a high degree. Now, it is characteristic of the North and South Downs that they are both cut through by the principal streams draining the Weald, and accordingly we find that more or less important towns lie at most of these cuttings, at the base or on the margin of the chalk, either the inner margin or outer margin or both.

At the west end of the Hog's Back the town of Farnham lies in a hollow close to a well-marked breach, through which now runs the London and South-Western Railway. Here the Wey comes within about 2 miles of the Blackwater, and between the two is a small fault, which has probably helped to form the depression. Possibly the Blackwater has flowed through this depression at some period, but if so, its headwater has at some period been tapped by the Wey working its head back along the softer beds to the south of the Chalk. At the east end of the Hog's Back the Wey, after describing a curve to the south and winding through the sandy Folkestone beds of the Lower Greensand, crosses the Chalk on its northerly course to the Thames; and at the crossing-place stands Guildford, in a depression indeed, but still mainly on a chalk foundation. Eleven miles in a direct line further east the Mole similarly breaks through the Downs, and at this opening stands Dorking, mainly on the Folkestone beds to the south of the Chalk. About 7 miles further east the escarpment of the Chalk begins to trend north-eastwards, to the mouth of one of the deepest of those now riverless furrows to be found in this ridge—the furrow leading by Merstham and Chilpenden to Croydon, now followed by the Brighton line from London Bridge; and just below the point where the north-easterly trend begins stands Reigate—that is, "ridge-gate"—the village of Merstham lying on the Upper Greensand accurately at the mouth of the furrow, but off the course of the east and west road from Farnham to Maidstone.

Here we may note a trifling but not uninteresting effect of a change in economic conditions. The position of Reigate at the point where the Chalk escarpment begins to trend north-eastwards to the Merstham-Croydon furrow* indicates that, in former times, the communication south of that gap was more important toward

* This is the furrow known locally by the prosaic name of Smiffham Bottom, and so named on the Ordnance Survey map, but called by Dr. Gregory in his 'Great Rift Valley' (p. 251), where he refers to it as an illustration of the beheading of rivers, by the more poetic name of the Golden Valley. A mere glance at a geological map of the district, apart from the specific evidence which Dr. Gregory adduces, is enough to convince us that a small river system must have existed here at one time.

the west than toward the south. South of Reigate and the parallel on which it stands lies the extensive plain of the Weald Clay, a plain extremely difficult to cross in wet weather before the communications were improved and deepened, and for this and other reasons not favourable to population. Now, however, the railway disregards such obstacles. The Brighton line, after traversing the gap referred to and the gap in the Lower Greensand hills immediately to the south, proceeds right onwards across the Weald, and we now find that population is increasing, not so rapidly in the old town of Reigate as in Redhill, a part of the municipality a mile or two east of the old town, situated at the foot of the Lower Greensand hills, exactly where the north-south is crossed by the east-west line.

Still further east the North Downs are traversed by the Darent, the Medway, and the Stour, towards which the chalk slopes down on both sides, and at or near the entrance to the furrows of these rivers stand Sevenoaks, Maidstone, and Ashford; while at the northern margin of the chalk valley of the Stour, on an expansion of brick-earth, stands the city of Canterbury.

The South Downs, again, are pierced in the order from west to east by the Lavant, the Arun, the Adur, the Ouse, and the Buckmere; but the importance of the towns or villages at or near the breaches made by these rivers is diminished in some cases by special circumstances. The breach of the Lavant is marked by the city of Chichester, which lies on the direct east road, and now also on the railway leading north of Portsmouth and Langston harbours to the coast towns in the east of Sussex. Formerly it had also the advantage of being a seaport, the Lavant having been at one time navigable so far. Arundel lies on the navigable Arun and on the east and west road already referred to, but not on the line of the South Coast Railway. The immediately contiguous villages of Steyning and Bramber lie just at the south side of the gap made by the Adur, but, owing to the projection of chalk hills southwards to the west of the river, off the line of the east and west road on this side. Formerly, however, their importance was increased by the fact that the Adur was navigable to the point where these villages stand. They have been identified with the *Portus Adurni* of the Romans. Till 1832, their former importance was indicated by the fact that Steyning returned two members to Parliament. Still, such importance as belongs to this gap has long been marked rather by the seaport of Shoreham, now New Shoreham, at the mouth of the Adur, than by the villages at the breach through the Downs.

On the other hand, Lewes, which stands partly in a narrow strait between two chalk cliffs formed by the main ridge of the Downs, on opposite sides of the Ouse, partly on the western of the two cliffs, just above a fan-shaped expansion of alluvium which covers the plain beneath—a situation obviously in former times of considerable strategic importance—has the economic value of its site considerably increased by the fact that the Downs here begin to trend east-south-east instead of east. In consequence of this change of direction, the gap, which here occurs, serves, for those coming from the west and south, as an entrance into the districts lying to the east as well as to the north. Hence the main eastern road from Brighton trends slightly north towards this gap, and is continued on the north side of the Downs. But this change in direction of the main ridge of these chalk hills which gives increased importance to Lewes deprives the Cuckmere gap of nearly all its value, causing it to lead merely to the small coast-strip between the Ouse and Beachy Head.

West of the Weald the main ridge of the South Downs is continued westwards, through the south of Hampshire and Wiltshire, and in these counties the breaches made in it by the Itchen and Avon respectively are marked by the cities of Winchester and Salisbury.

Here it may be noted that the positions occupied by Salisbury and its predecessors, Sorbiodunum and Old Sarum, though within two miles of each other, and both deriving their importance at least in part from the notch through which the Avon descends to the plains of Hampshire, yet do not possess the same geographical advantages. Sorbiodunum, afterwards Old Sarum, was founded for a different reason from Salisbury. It stood on a round chalk hill immediately above the Avon, on a site well suited for defence, and no doubt selected for that reason. The name of the village of Stratford under the Castle, just below, still commemorates the spot where the Roman road from Silchester to the south-west forded the Avon. But any one coming from the south through the notch of the Avon, and intending to proceed westwards, would have to go out of his way to go to Sorbiodunum. About two miles to the south of the hill on which that town stood, a valley from the west joins that of the Avon. About three miles above this point the western valley forks, affording two routes to the west, one by the valley of the Nadder, and another more north-westerly, by the valley of the Willy, or Wylve. At the junction of these two minor valleys stands Wilton, which, as already mentioned, was at one time the chief town of the country, and did not lose its importance till after the foundation of the modern Salisbury. The great western road, passing through Old Sarum, branched at Wilton, which was hence an important nucleus of trade. But when defence had come to be a minor consideration in determining the site of towns, Old Sarum was abandoned early in the thirteenth century, on account of its lack of water, and the new city of Salisbury was built on a site having other advantages besides a great abundance (a somewhat too great abundance) of what the older city was so much deficient in. For the new city, being situated just within the notch of the Avon, and at the junction of the western valley, served as a point of convergence and divergence of the trade for the west and north, as well as, like Old Sarum, the north-east, and made it unnecessary to have a further nucleus at Wilton for the upper parts of the valleys of the Willy and Nadder. For some time after the foundation of Salisbury the western road seems to have followed the old route, but from the time that the bishops of Salisbury turned the western road, Wilton, says Camden, gradually fell into decay, so that even in his time it had become only a small village, yet governed by a mayor.*

Of the rocks geologically below the Cretaceous system, some members of the Oolitic series are those which show the most marked distinctive topographical features which have influenced the distribution of the towns and villages. The series named forms the upper division of the Jurassic system, the lower division of which is composed of the Lias. The members of this latter series mainly consist of clays, forming flat plains or broad shallow vales, while the most conspicuous members of the Oolitic series are the limestones, chiefly the Inferior and Great Oolite, to which the whole series owes its name, and which generally form tablelands with escarpments sinking down to Liasic plains on the west and north-west. These tablelands have a surface resembling that of the chalk. They are hence thinly peopled, and where these Oolites and the Lias crop out in contiguity, towns and villages are frequently met with in Liasic valleys running up into the limestones, or at the base of Oolitic escarpments. In the Cotswold, including the Lockhampton Hill-east of the Severn, we have an example of such an escarpment looking down on Stroud and Cheltenham, as well as numerous villages on the Lias at its base. A still better marked, or at least more continuous, escarpment of this series is seen in Lincolnshire, where the western edge of the Oolites forms a nearly straight line running from north to south about the meridian of the city of Lincoln, forming the

* *Britannia*,* Gough's edit. (1785), vol. i. p. 39.

High Dyke, or Lincoln Heights, its western margin being marked by a close-set line of villages beginning at Whilton on the Humber, and ending with Carlton Scroop, about 16 miles north of Grantham. South of Lincoln this line of villages at the base of the Oolitic escarpment is followed by the Great Northern line to Grantham. The surface of this Oolitic formation, here known as the Lincolnshire Limestone, is in most places markedly bare of villages, whereas most of the villages referred to lie on narrow strips of the usually rich Middle Lias Marlstone or the Upper Lias Clay shale, or both, which are benefited by the addition to the water supply furnished by the higher limestone adjoining. South of Lincoln the villages belonging to this series, from Wellington to Waddington inclusive, lie on the Lincolnshire Limestone itself, and Winterringham, close to the Humber, lies partly on the same foundation. In the situation of these villages we may perhaps see the influence of circumstances referred to by Dr. F. G. Hall, that where soils of different degrees of fertility adjoin, the less fertile is preferred for the site of the towns or villages, the more fertile for the fields.

It will lead us into too much detail to attempt to say much about the influence of rocks geologically older than the Jurassic on the position of English towns and villages. Every one knows, of course, that the Coal Measures are crowded with manufacturing towns, and all that need be said about them is that in most cases their rise dates from a comparatively recent period. It was long before coal attained importance in any branch of manufactures. Its sole use was in the form of domestic fuel, and in most of the coalfields its use was only local. For centuries the one great centre of trade in this commodity was Newcastle, the one good port in immediate proximity to productive coal-mines. Even the coal-trade of Sunderland was of little consequence till the latter half of the eighteenth century. Of the inland coalfields the first to obtain any great degree of importance appears to have been that of south Staffordshire, which in the seventeenth century supplied fuel for iron manufactures. In this industry, it was at that early date almost confined to the working up of iron already smelted; for, although coal was used in the smelting of iron even in the reign of James I., the attempts of this nature were isolated and restricted, and without any effect on the general character of the industry, and it was not till after the middle of the eighteenth century that coal began to be widely used for this purpose.

The Carboniferous Limestone, below the Coal Measures, forms in many places well-marked surface features, but these have generally little to do with the distribution of towns and villages. We may note, however, as an exception to this statement, the Carboniferous Limestone of the Mendip Hills, at the base of which lie Compton, Axbridge, Cheddar, Stoke Rodney, Westbury, Wells, Dinder, and Crocombe, all in Dolomitic Conglomerate and New Red Sandstone rocks, some partly on the limestone. The city of Wells lies at a break where a road ascends north-east to Devonian heights before reaching the Carboniferous Limestone, and another east up a valley of the New Red Sandstone.

Over the whole of the midlands of England and on both sides of the Carboniferous rocks of the Pennine Chain are spread various members of the Permian and Triassic systems, forming what is known collectively as the New Red Sandstone. The rocks of these systems have mainly formed a gentle undulating surface, and yielded a fertile soil. The area occupied by them is hence thickly crowded with towns and villages. There is, however, one formation belonging to this series of considerable extent which does not share in the general character just mentioned. The formation referred to is the Bunter Pebble beds, which lies geologically between two soft sandstone formations of the lower division of the Trias, and consists chiefly of pebbly conglomerates or hard sandstones mingled with

pebbles. These beds have mostly resisted the denuding agents to a greater extent than adjoining rocks, and hence form higher grounds with a thinner and poorer soil than is usually met with in the division to which they belong. A considerable tract composed of these beds, extending northwards from Nottingham to Worksop, and comprising Bestwood Park, Arnold Forest, Assart Wood, Robin Hood's Hills, Sherwood Forest, Rufford Park, Birkland Forest, Bailby Forest, Thoresby Park, Clumber Park, and Worksop Manor Park, is still one of the most thinly peopled parts of England, and includes, as the names indicate, large areas of woodland. The northern portion of it, where so many "parks" are situated, forms the district known as the Dukeries. The town of Mansfield lies on Carboniferous Limestone, exactly on the west margin, that of Worksop on Lower Bunter Sandstone, exactly on the north margin, of the Pebble beds.

On the other hand, these beds, where less extensively developed, afford in many places solid foundations for towns in the neighbourhood of which are deposits of another kind. Towns so situated are Stockport (partly on Permian Sandstone), Holt in Denbighshire (at a point where these beds interrupt the alluvium of the Dee), Ashbourne in Derbyshire, Leek in North Staffordshire (partly on Forestale Sandstone*), Cannock in Staffordshire, Market Drayton, and Newport in Shropshire (the latter partly on Upper Bunter Sandstone), Preston, Lancaster, and Thorne.

In the south-east of England, in the angles between the fingers of the Chalk, the nature of the superficial deposits presents many points of interest with regard to our subject. Those connected with the angle between the North and South Downs need not be touched on here, as they are fully dealt with in Topley's 'Geology of the Weald,' pp. 314 *seq.* But there are many such points worth noting in connection with the angle comprising a large part of the Thames valley, and containing the greater part of the London Clay; this deposit is generally characterized by the small number of towns and villages to be found on it. For the most part, the sites preferred either belong to other members of the so-called London Tertiaries (in which sands, gravels, loams, and conglomerates predominate), or such as have the London Clay covered by more recent deposits of glacial or other origin. The reason for this is no doubt the fact that water is generally difficult to obtain in this deposit. Prof. Prestwich has pointed out that the difficulty of obtaining water retarded the growth of London towards the north until water was conveyed thither in pipes, and caused the suburbs to spread rather west and north-west, where there are extensive deposits of glacial gravel and sand. To the north-west and north of London, Edgware, Stanmore, Bushey, and Harrow-on-the-Hill are the chief places on the London Clay. Pinner lies on a patch of the Woolwich and Reading Beds; Totteridge, Chipping Barnet, and Moskon Hadley occupy patches of pebble gravel of uncertain age; Finchley is situated on boulder clay, Southgate on glacial gravel and sand; Hampstead and Highgate are on the Lower Bagshot Beds; Tottenham, Edmonton, Enfield, Hoddeston,† and Waltham Cross on gravel and sand to the west, and Waltham Abbey on a similar deposit to the east, of the alluvium of the Lea. While Epping and Hainault Forests are both chiefly on London Clay, the town of Epping lies on a deposit of brick-earth overlying that formation. Chigwell is situated chiefly on a patch of glacial gravel and sand; Brentwood and Havering-atte-Bower lie on patches of the Lower Bagshot pebble-beds; Barking, Great and Little Ilford, and Romford all on

* Lower Carboniferous.

† Hoddeston partly on the Woolwich and Reading Beds.

gravel and sand, the last immediately adjoining London Clay. Farther east, in Essex, the only towns or considerable villages on London Clay are South Benfleet, Leigh, and Burnham (the last partly on brick-earth). To the north Dunmow, Braintree, Colchester, and Hadleigh (Suffolk) lie on glacial gravel overlying London Clay.

South of the Thames, only recent London suburbs (Brixton, Streatham, Norwood, Sydenham) are on London Clay; while in the south-east Eltham, Bromley, Chislehurst, and Hayes are on the Oldhaven beds; Orpington, the Brays, Bexley, and Crayford are on a narrow strip of gravel and sand; Dartford, Sutton-at-Hone, Darent, Horton Kirby, Farningham, Eynesford, Lullingstone, and Shoreham all on a similar deposit or on chalk. In the south-west, Morden and Hook are the only considerable villages entirely on London Clay, although many others on the borders straggle on to this formation. All the villages already mentioned as lying on or near the north border of the Chalk between Guildford and Croydon, where not on the Chalk itself, have their nuclei on a narrow strip of the Woolwich and Reading beds or on recent gravel, while outside of but on or near the north margin of the London Clay in this quarter lie Merton, Wimbledon, Esher, Cobham, Ripley, Send, and Worplesdon. Since the laying of the railway Wimbledon has descended to the London Clay low grounds, but Old Wimbledon is confined to the upper gravel flats.

In many cases the presence of river-alluvium and recent marine deposits has manifestly determined the precise situation in which early settlements grew up. For the most part alluvial sites are avoided, and many of the towns found on such sites are of comparatively recent origin, and some have been deliberately created on account of special advantages of the position, in defiance of the disadvantages of the site. Of course, alluvial deposits are not absolutely uniform in character. In some places they are drier and more firmly consolidated than in others, and in alluvial plains very slight inequalities of surface will favour the drainage and consolidation of the higher parts, and all the more when the inequality of the ground is due to some firmer subjacent deposit, which has had the effect of thinning the covering of alluvium. Moreover, it is to be borne in mind that the unsuitability of an alluvial site as a foundation for building is not the only reason for avoiding such sites, when others of a different kind are available in the vicinity. The very richness of alluvial deposits is a reason for not covering them with buildings, and for establishing the villages on adjoining deposits.*

On both banks of the Thames and its estuary below London, the marshy nature of the littoral alluvium is the chief cause of the comparative paucity of towns and villages, most of which stand on sites where deposits of another kind are met with on the bank. On the north bank of the Thames, the presence of chalk at Purfleet and gravel and sand at Grays Thurrock has allowed of the formation of settlements, while chalk comes very close to the shore at Tilbury, and gravel and sand at Southend and Shoeburyness; on the south bank, Woolwich stands on the Oldhaven beds, Erith on Thanet beds, and Greenhithe and Gravesend on chalk. The surface of the Isle of Sheppey is entirely alluvial, but it gradually rises towards the north, where the alluvium overlies cliffs of London Clay, above which the villages of Minster and Warden (formerly further inland) are situated. The town of

* See the remarks made by Dr. E. G. Hahn on the towns of the Geest and Marsch of North Germany in *Die Städte der Norddeutschen Tiefebene in ihrer Beziehung zur Bodengestaltung*, p. 47 (*Forschungen zur deutschen Landes- und Volkskunde*, Bd. I. Heft 3. Stuttgart, 1885).

Sheerness and the older but now decayed town of Queenborough lie on softer alluvial sites, but both of these towns took their origin in works erected for defensive purposes. The town of Queenborough, named after Queen Philippa, grew up round a castle built in 1366 by her consort, Edward III., and a well 200 feet in depth had to be dug for water, which even at that depth was brackish, pure water not being obtained till the well was dug 80 feet deeper in 1729. Sheerness, again, hardly existed as a town before the erection of the defensive works begun by Charles II., and its site is in a large measure artificial, composed of piles and the carcasses of old ships.

From Whitstable Bay to Reculver the shore-line is formed chiefly by London Clay, which is here made more suitable for town and village sites by being underlain in places by Oldhaven beds, as well as by superficial patches of brick-earth. The old village of Herne stands on a patch of Oldhaven beds a little south of the shore-line at Herne Bay, which watering-place of recent growth stands immediately to the east of a deposit of brick-earth, though the actual site is composed of London Clay. To the east of Reculver, west and south of the Isle of Thanet, lies the strip of alluvium occupying the place of the navigable channel which in the earlier historic period separated that island from the mainland of Kent. This alluvium is entirely without villages. Stourmouth, whose name still recalls the time when both the Stours of this district flowed directly into the channel just referred to, stands on the east side of an expanse of brick-earth immediately adjoining this alluvium; and Minster overlooks that alluvium on the north, standing on a patch of the Thanet beds, which form a thin strip to the south of the chalk of which the Isle of Thanet is mainly composed.

The only place on the alluvium of Romney Marsh which at any time had any great importance was Romney, that is, Old Romney, two miles inland from New Romney, a thriving member of the Cinque Ports down to 1284, when it and its neighbour Lydd, another Cinque Port, standing, however, not on alluvium, but on an embankment of gravel and sand, were cut off from the sea by a violent storm, which changed the course of the Rother, causing it to enter the sea by a shorter route close under Rye. Both this latter town and Winchelsea stand on somewhat elevated sandy deposits belonging to what are known as the Hastings beds, on the margin of the alluvium, the town of Rye terminating on the south side in steep cliffs descending to what was evidently an old shore-line. On the margin of the same beds lie the inland villages of Iden, Stone, and Appledore; and at the east end of a detached portion of these beds lies Pevensey, on the border of another alluvial tract known as the Pevensey Level; while the modern watering-place of Eastbourne occupies a patch of gravel and sand just east of the chalk of the South Downs, and south of an outlying portion of the same level. Lympne, an important seaport in Roman times (*Portus Lemania*), and even as late as the Danish invasions, stands on calcareous deposits of the Lower Greensand, and on Gault Clay on the north margin of the Romney Marsh; and Hythe, its successor, about two miles to the east, lies on shingle beds.

On the east coast the site of Harwich is indeed alluvial, but the alluvium is spread over a cliff of London Clay, containing abundance of shells and cement stones, and lying over a thick bed of chalk. Further north, Dunwich stands at the north end of an insular patch of sand, Red Crag, gravel, and boulder clay surrounded by alluvium, and Southwold on another insular patch of pebble gravel of uncertain age. Another similar insular patch between Lowestoft harbour, the Yare, and the Waveney contains the old town of Lowestoft and the maritime villages to the north. Large tracts of the alluvium on both sides of the lower Yare, as well as its tributary the Bure, were still very imperfectly reclaimed at the end of last century, not

supporting a single hillock.* Inland, the town of Eyn stands almost entirely on a patch of boulder clay surrounded by alluvium.

By far the largest area of alluvial and other recent deposits is of course that known as the Fenland, west and south of the Waab. The area so designated, though everywhere low-lying and level or nearly level, is not uniform in its composition, and the distribution of the villages on it is determined largely by the diversities in the nature of the site and the slight inequalities of surface. The margin on the west and south is composed of gravel, and on these strips the villages are numerous, the gravel affording a firm foundation and a fairly good water-supply. This gravel strip in South Lincolnshire is marked by the close-set series of villages beginning with Billinghay, 13 miles north-west of Boston, and running nearly due south by Bourn to the border of the county. In the south the gravel is more widespread, and the villages on it somewhat more scattered. A strip of about two miles or more in width to the east of the line of villages just mentioned, and a much wider tract in the south of the Fen country, is composed, on the surface, of peat, and the entire area so covered, although composing nearly half of the Fens, contains only a single village, namely, Benwick, on the Cambridgeshire border, 11 miles south-east of Peterborough, and here the peat is thin, with gravel underneath.†

The remainder of the Fen country is composed of silt at a general altitude of about 15 feet above ordnance datum, and on this area villages are plentiful, although water has to be obtained by pumping from the drainage canals, very little water, and that of inferior quality, being obtainable from wells. Many of the towns and villages of this area occupy slight elevations, 20 to 80 feet above the surrounding country,‡ sites which, as is still shown by the names of the villages (Thorney, Whitlouse, Eastrea, Stamma, Mamma, Hilgay, Southery, Ely, Covey, Stunthney, Siltsey, Stickney, etc.), once formed islands,§ surrounded by marsh if not by water. In some cases these higher sites are formed of different deposits from the surrounding country. Ely, for example, is on an isolated patch of lower Greensand, bordered east and west by Kimeridge Clay. Siltsey and Stickney (north of Boston) both stand on isolated patches of boulder clay. In other cases, no doubt, the adjacent deposits, whatever they may be, come nearer the surface than under the surrounding lower alluvium.

The peninsula of Holderness is mainly covered with boulder clay, which is divided into an east and a west section by the alluvium of the Hull river, and is bordered on the south by a strip of alluvium stretching to the Humber. The south border of the boulder clay is approximately marked by the villages of Hessle, Cottingham, Sutton, Hedon (the predecessor of Hull as a seaport), Kayingham, Ottringham, Parrington, Welwick, Skelling, and Easington. The gap between Cottingham and Sutton is occupied by the alluvium of the Hull, on which there is not a single village north of Newlands (now within the parliamentary borough of Hull). Beverley, Waghen, Bouth, and North Frithingham all stand on boulder clay; Great Driffield is partly on boulder clay, mainly on glacial gravel and sand. Hull stands wholly on alluvium, but is an artificial creation like Queenborough and Sheerness.

In the south-west of England there is a wide stretch of alluvium in the county of Somerset, between the Blenden Hill, north of the estuary of the Axe, and the

* Garnier's 'History of English Landscapes, Modern Period,' p. 346.

† 'Geology of the Fenland,' by S. R. J. Skerrett; Memoirs 4 ('Memoirs of the Geological Survey of Great Britain and Ireland,' 1877).

‡ Ibid., p. 2.

§ Ibid.

Parret, but the alluvium is not absolutely continuous, and sites for many of the villages of the district have been found on small isolated patches of other formation. Pawlett, Puriton, Cassington, and East and South Brent all stand on patches of the Lower Lias Clay; Chedzoy and Westonroyland on patches of New-Red Marl (Triassic).

All over England there are numerous examples in which the villages exactly cover small areas of river-gravel which interrupt river-alluvium, and there are some interesting cases in which the margin of the river-alluvium is marked by villages on both sides. Thus the town of Leicester and the villages of the Wreak and Soar valleys mostly lie on the New-Red Marl, some on Lower Lias Shale or Limestone bordering the alluvium, Quorndon being the only village that spreads widely over the alluvium. In the valley of the Dove, from Rochester downwards, Rochester, Scropton, and Marston-upon-Dove are the only villages on alluvium; Uttoxeter, Marchington, Tutbury, and Rolleston all standing on or at the base of New-Red Marl heights on the right bank; Doveridge, Sudbury, and Hilton in similar situations on the left bank, bordering the alluvium.

THE MONTHLY RECORD.

EUROPE.

Investigations in the Balkan Peninsula.—The *Denkschriften der Kais. Akademie der Wissenschaften in Wien* include a paper by Prof. Franz Toula, of Vienna, on the Eastern Balkans, containing the final results of his important work in that region. The most startling conclusion is that, contrary to Theobald Fischer's hypothesis, the Balkans are not *Schollen*, or fracture mountains, but *Falten*, or fold mountains, whereby the usual division of the Balkan peninsula falls to the ground. The Eastern Balkans are a single range, while, according to the researches of Prof. J. Cvijić of Belgrade, the Western Balkans form in their southern part six ranges, the orographical expression of a geological "virgation." Into the flexures of that part where, by a sharp turn, the Balkan system unites itself to the Carpathians, is dovetailed a range of sedimentary mountains running east and west, and breaking off in the Morava valley against the crystalline masses of Southern and South-Western Servia. Professor Cvijić was, in the early part of this year, engaged on a survey of the Rila Dagh (improperly Rilo-Dagh), near the frontiers of Bulgaria, Eastern Rumania, and Turkey, and he has confirmed and extended the excellent work of the Russian surveys. Musala, the culminating peak of the range, stands second only to Mount Olympus in the peninsula, attaining 2950 feet. A line of fracture traverses the Rila-Dagh almost in a straight line, dividing it into a north-western portion composed of crystalline schists, and a south-eastern composed of granite. The discovery of unmistakable traces of glacial action in the centre of the range is also new.

The Census of 1895 in Bosnia and Herzegovina.—Dr. Ernst Gallina contributes to a recent number of the *Mittheilungen* of the Vienna Geographical Society some results of the census of Bosnia and Herzegovina on April 22, 1895, comparing them with those of 1879 and 1885. Rough estimates, compiled from various sources, gave the population in 1851 at 1,021,000, and in 1871 at 1,026,000; while the last census under Turkish rule gave 1,031,000 in 1870. The first Austro-Hungarian census of 1879 gave for the occupied provinces 837,650 males and 550,514 females, or a total of 1,388,164; in 1885 there were 705,025 males and 431,006 females—total, 1,136,031; and in 1895, 83,190 males, 730,302

females—total, 1,568,002; equivalent to an increase in the 1879-85 interval of 15·36 per cent., and between 1885 and 1895 of 17·36 per cent., or, for the whole period, of 35·39 per cent. The mean annual increase for the first interval is 2·56 per cent., and for the second 1·74 per cent., a somewhat surprising result, probably due to returning population and immigration following the occupation. The proportion of women to men was in 1879 as 905·17 to 1000, in 1885 as 895·10 to 1000, and 1895 as 893·40 to 1000, the decrease being attributable to the fact that the causes just mentioned as producing the increase of population affected the male more than the female sex. The returns give 6·99 per thousand as totally blind, 7·90 deaf and dumb, 10·92 lunatic and imbecile. The percentages of different faiths were—

			1879.	1885.	1895.
Mohammedan	...	...	38·73	36·88	34·99
Orthodox	...	...	42·83	42·76	42·94
Roman Catholic	...	...	18·68	19·80	21·31
Jewish	...	...	0·29	0·43	0·52

In the matter of occupation, agriculture claims a large majority—88·3 of the whole population. The average density of population in 1895 was 70 persons per square mile; in 1895, 78 persons. Dónja-Tuzla is the most densely populated district, with 103 per square mile. Only 51 towns and villages have over 2000 inhabitants, and 11 over 6000. In 1895 there were 238,059 inhabited houses, with an average of 6·59 persons in each.

Population and Area of Budapest.—The recently published statistical annual for the town of Budapest contains some points of geographical interest. The total area covered by the city and its environs was, in 1894, about 77 square miles, most of which lies on the slopes on the right bank of the Danube, and of this surface about $4\frac{1}{2}$ square miles are taken up by "streets, roads, and railways." A valuable population table is given for both Ofen (Buda) and Pest from 1720 onwards, and for the two towns together since their unification in 1874. A marked increase of population is first noticeable after 1840, and this only became steady towards the end of the fifties. Since 1840 Ofen, the older town on the mountain side, has scarcely doubled its population, while Pest, on the alluvial plain on the left bank, has become six times as large. The increase of the Magyar population is clearly shown by comparison of the years 1881 and 1891, which give in percentages:—1881, 57 per cent. Magyar; 24 per cent. German; 6·1 per cent. Slovak; 1891, 67 per cent. Magyar; 24 per cent. German; 5·6 per cent. Slovak.

ASIA.

The French Gunboats on the Mekong.—A full report of the ascent of the Mekong by the French gunboats *La Grandière* and *Musée* (*Journal*, vol. vii. p. 200) was given in May last, before the Paris Geographical Society, by Lieutenant G. Simon, the officer in command, and is printed in the *Comptes Rendus* (p. 202, *et seq.*, with map). After briefly sketching the previous attempts to navigate the river, which had been successful only as related to the section below the rapids of Khon, the speaker described in detail the course of the voyage made by the two gunboats from this point upwards, during which the various rapids met with on the central course of the river, as far as Xieng Khong, were successfully surmounted—some, however, with great difficulty.* As regards the

* Recent accounts report the passage of the Khon rapids by three other steamers, intended to ply on the upper river.

navigability of the Mekong on this part of its course, M. Simon's conclusions are as follows: The course of the stream between Khon and Luang-Prabang may be divided into four sections, differing as regards their usefulness as a waterway. (1) From Khon to the confluence of the Se Men (a little above Bassac) navigation is practicable for vessels drawing one metre from May to January, with the exception of the short interval (14 miles) between Khon and Khong, where the stream is broken up into numberless shallow channels, and is passable only between June and November. (2) The rapids of Kénarat are, most of them, passable when the water is at a medium height, *i.e.* from November to January, and in May and June, but the worst obstacles can be passed only during three months in all. (3) A long section of 375 miles could be made passable throughout the year if the rocks were removed at one or two points. During this section the Ngum, a winding stream ascended by M. Simon for some distance, joins the Mekong. It flows through a rich and populous district. (4) From Sampans (18° N.L.) upwards navigation is impossible at low water, but with a normal rise steamers could reach the mouth of the Nam Neun, and certain improvements of the channel would probably enable them to reach Luang Prabang during three months. M. Simon was struck with the mild and peaceable disposition of the Laos, who received him well everywhere. He considers the climate generally healthy, especially on the river. The year is divided into a wet and a dry season, the former lasting from April 15 to October 15, and the rest of the year being dry. For Europeans the picturesque province of Tra-Ninh (on the Annamite frontier in about 19° N.) is specially favourable by reason of its mild and temperate climate and rich soil. At Nong Khai, on the south bank of the Mekong, just south of 18° N., the Siamese have lately founded a settlement, which extends along the bank for 3 miles, and in this respect bears comparison with Luang Prabang. Its population cannot fall short of 8000.

Explorations in Celebes.—The last crossing of Celebes by the two cousins, P. and F. Sarasin, has been accomplished in virgin ground, and accordingly is to be regarded as the most remarkable of their achievements. Their journey on this occasion led through the region where the almost unknown south-eastern peninsula of Celebes joins the core of the island. It began at the bay of Usu, one of the minor indentations of the Gulf of Boni, and ended at the bay of Tomori, on the east coast. Two lakes were discovered on this journey, Matanna and Toruti; the former draining into the latter, which considerably exceeds Lake Poso in size. The shortness of the time at the disposal of the explorers prevented them from making a complete survey of the lakes, nor could their inquiries elicit information as to where the outlet of the larger lake reaches the coast.—*Petermanns Mittheilungen*, 1896. No. 11.

Crossing of Borneo.—On July 3, this year, Dr. A. W. Nieuwenhuis started from Pulu Sibau on the Upper Kapuas, with the intention of crossing Borneo eastwards to Kutai at the mouth of the Mahakam. The land journey entailed will be very short, most of the route being by the rivers Kapuas and Mahakam.

The Valley of the Upper Euphrates.—In Mr. Vincent Yorke's paper on "The Valley of the Upper Euphrates," the title of the illustration on p. 329 (October number) should be "Another View of the Roman Bridge near Kiakhia." The first view is on p. 323.

AFRICA.

The Road to the Victoria Nyanza.—Captain B. L. Schlater sends further details respecting the progress of the road which is being constructed under his superintendence through British East Africa to the Victoria Nyanza (see *Journal*, vol. vii. p. 692). Between Kikuyu and the Kodong escarpment the country was

difficult. The plateau is broken by deep valleys running in all directions, a noticeable feature being the occurrence of hollows from 100 yards to 3 miles in diameter, surrounded by low hills, and occupied during the rains or throughout the year by swamps, some with no drainage, others sending streams to the Athi and Tana rivers. These often necessitated *détours* through thick forest. The descent of the escarpment—approximately by the route laid down for the railway—is by far the heaviest piece of work on the road, and much blasting was necessary; but in the end an excellent road was made, with a maximum gradient of 1 in 10, the greater part being 1 in 12. One hundred Baluchis and 200 Wakikuyu were employed on it. The Kedong river, where crossed, runs in a deep gorge about 30 feet deep and only 4 feet broad, which was bridged by wedging in large stones at the top and covering them with small stones and earth. The road proceeds thence over plains by the pass between Longonot and Kejabe to Nalvaaba, at the north-east corner of which there is a strong post under Major Smith. The Momenat river, about 6 miles beyond the station, required bridging, timber being obtained from the juniper forests on the hills to the north. The bridge has six spans of 22 feet, and should last until the railway reaches that point. The Gilgil river, 6 miles beyond, also needs a bridge. The plains rise slowly thence to Elmentita, near which is an escarpment with a perpendicular drop of 300 feet. The road skirts the east shore of Elmentita, about 200 feet above it. Passing the north-east corner of Nakuru, it leaves the old caravan track, and, after crossing the Molo river (requiring a bridge), ascends by easy gradients to the Eldoma station. Except the bridges, this section was completed in June. Beyond Eldoma the road follows the deep valley of the Eldoma river, running due west between Mounts Kilirobi and Londiann. It then keeps to the water-parting between the Nzala on the north and the Nyandio and Yaia on the south. There is no regular escarpment, but the country rises gradually from the floor of the rift-valley to the upper plateau of Mau, broken by the deep valleys of numerous streams. The whole slope is thickly wooded, involving much difficulty in the selection of a good line for the road. Captain Selater hoped, however, to get through to Nandi by the end of September. Regarding the prospects of the country, he considers that the station at Nalvaaba will completely overawe the Maasi, who, he believes, would never have interfered with anybody who showed the smallest signs of resistance, their power depending solely on the bogus stories of the Swahili. The whole floor of the rift-valley is most excellent grazing-ground, and he considers that the future of the country undoubtedly lies in ranching. The Mau and Nandi plateaux are especially fine, enjoying a perfect climate, malaria being unknown above 7000 feet. They are watered by numerous perennial streams in deep wooded valleys. Mau is at present uninhabited, but in Nandi the cattle and sheep are the finest in the whole country. Captain Selater has collected materials for a sketch-map of the part between Eldoma and Nandi.

Lieut.-Colonel V. Trotha's Journey to the Victoria Nyanza.—A journey has lately been made by Lieut.-Colonel V. Trotha through the little-known northern districts of German East Africa, from Kilima Njaro to the Victoria Nyanza. His route led past Arusha and Mounts Kavinjiro, Gerinusi, and Donyo Ngai to the Natron lake, whence he proceeded to Mori Bay on the Victoria lake by Marid and the valley of the Dabash. He then followed the shore of the lake as far as the Anglo-German boundary, afterwards turning south, and finally reaching Muanza by way of Speke gulf and Ukerewe island. His observations, which include large numbers of determinations of altitude, compass bearings, etc., have reached Dar-es-Salaam, and are being worked up by Dr. Stuhlmann and Maurer. Between Arusha and Ngaruka the country is an interesting combination of mountains and

cauldron-like depressions, Ngaruka being placed in one of the latter. Both here and in the neighbourhood of Ngurumani, north of the Natron lake, great discrepancies were observed between maps based on Flecher's journey and the reality. Ngurumani itself lying south, not north, of Mount Zambo, so that it was difficult to determine on which side of the mountain the Anglo-German boundary passes. The Wakuafi colony at Ngurumani has deserted the place, although the neighbourhood is well watered and suitable for cultivation. Beyond Ngurumani the country was uninhabited for a long distance, consisting of bush-covered plateaux, mountains, and cauldron-shaped valleys. Nearer the lake, the country of the Warege and Wanyabasi, offshoots of the Maasi, with whom they live at feud, was reached. They are a fine, well-made race. On the lake itself, the Basaoba, a tribe of the Wagaga, showed warlike inclinations; but here, as elsewhere throughout the journey, peace was maintained.—*Deutsches Kolonialblatt*, 1896, Nos. 19, 20.

Journey to Lake Rudolf.—Mr. A. H. Neumann, an Englishman, who has spent some time in British East Africa for purposes of sport, and was met by Dr. Kolb in the neighbourhood of Mount Kenya in 1894, has returned after making his way to Lake Rudolf. He reached the lake at its south-east corner, and followed its eastern shore as far as the Reshafi country (Ruia of Dr. Donaldson Smith). We hope shortly to receive fuller details from the traveller. According to news received at Rome, Captain Böttinger is reported to have also reached the lake, and to be on his way back to Mombasa.

Dr. Kolb's Journeys to Mount Kenya.—The tenth number of *Petermann's Mittheilungen* contains an account by Dr. G. Kolb of his two expeditions to Mount Kenya, undertaken during the years 1894-1905, with a map on the scale of 1:1,000,000 based on his surveys.* On the first expedition Dr. Kolb followed in the main the route of Dr. Krapf through Ukambani, joining that of Pigott in 1889 before reaching the upper Tana. His route north of that river was to the west of that of Chandler and Von Höhnel, and he ascended the wooded lower slopes of Kenya to a height of 8000 feet. Three tribes dwell in this neighbourhood—the Wa-kita (who call themselves an offshoot of the Wakamba), the Masai, and the Wa-atorobbo (elephant-hunters). The traveller's attempts to enter into friendly relations with the last-named failed on this occasion, by reason of the suspicion with which they regarded Europeans owing to the proceedings of the German "Kima Pasha Relief Expedition." On the second journey the route led along the eastern foot of the Ukambani hills, and Dr. Kolb was able to collect new information with regard to the waterless steppe which stretches eastwards towards the coast, and northwards to within a day's march of the Tana. The surface is generally level, but isolated peaks and ridges rise occasionally near the western border. Towards the east they become fewer. On Mount Madua, which Dr. Kolb ascended, he saw moraine-like deposits, although the height of the summit is only about 6000 feet. The steppe is uninhabited, though traversed by the Wakamba during their raids on the Gallas, and visited by elephants and other game during the rainy season. From inquiries regarding the streams which flow across the steppe from the hills (the principal of which are the Tiva and the Nana), Dr. Kolb thinks that several of them may reach the Tana during the rains. He even thinks that the upper Athi may once have flowed in the same direction, the narrow Yatha ridge which alone separates it from the Tiva being possibly of recent origin.

* These depend on careful compass-bearings of peaks seen en route, connecting with Von Höhnel's work in the north, and fixed in the south by astronomical observations and bearings of Kilimanjaro taken at the German mission station of Ukamba.

Kenya was reached on the second occasion by a slightly different route from the former. The ascent—made from the north-east—was very gradual, and led through the usual zones of vegetation, a small alpine lake being discovered en route. The upper part of the mountain consisted of a wide oval plateau scantily covered with grass and a species of rhododendron, various peaks rising from its outer margin. A day's march across the plateau, during which the traveller suffered from headache and bleeding from the nose, brought him within 1½ mile of the summit, which he names Victoria peak. It rises at the west side of the plateau. Dr. Kolb thinks its ascent might be possible, though difficult. A sleepless night was spent in this elevated region, the thermometer sinking to 94° Fahr. After a slight further advance the next morning, the traveller retraced his steps, descending by a route little differing from that used in the ascent. The altitude of the highest point reached does not seem to have been determined, and as the ascent was made from the opposite side of the mountain to Dr. Gregory's, it is difficult to correlate the work of the two travellers. Dr. Gregory's route is not shown on the map.

M. Hanolet's Journey towards the Shari Basin.—Among the Belgian officers who, previous to the delimitation of the northern boundary of the Congo State, explored the regions lying between the basins of the Congo, Nile, and Shari, now forming part of the French territory, Lieut. Hanolet deserves a foremost place for the extent of his journeys towards the north. Although his itineraries were utilized in the map of the northern tributaries of the Ubangi published in the *Mouvement Géographique* for November 24, 1895, no full account of the journey has been published in that paper. Some details have, however, been given in the *Bulletin du Comité de l'Afrique Française* (July, 1896, p. 220), taken from the *Belgique Coloniale* of Brussels, and accompanied by a sketch-map, showing the route followed. M. Hanolet's furthest point towards the Shari appears to have been a little south of the important market of Kuks, in Dar Runga, in about 9° 40' N., which, according to the map, he did not actually reach, as stated in the *Mouvement Géographique*, 1896, col. 290. According to M. Hanolet, the country of Dar Banda has been brought completely under the influence of Arab civilization.

Exploration of the Luapula.—Mr. Poulett Weatherley, whose journey by a new route to Lake Mweru we noticed in vol. vii. p. 204, left that lake in June last to explore the Luapula and Lake Bangweolo with the help of a steel section boat. By the end of July he had reached Kiayama's town, in 11° 14' S. lat., but had been only occasionally able to use his boat, as the river above Johnston falls is a succession of rapids and cataracts. He hoped to strike across by Mero Mero's to Lake Bangweolo, and to thoroughly explore that lake. From Mweru he had journeyed along the foot of the Kundelungu plateau, being everywhere enthusiastically received by the natives. He was struck by the beauty of the scenery and by the extent of cultivation met with, the inhabitants being naturally peaceful and diligent agriculturalists, though at present much disturbed by wars.

Map of the Congo State.—Maps of various sections of the Congo state, on a uniform scale of 1 : 2,000,000, have appeared from time to time as supplements to the *Mouvement Géographique*. In this way, M. Wauters intends to complete the whole map of the state, the remaining four sheets being promised during the first quarter of 1897. The sheets are not all of the same size or shape, but are arranged in accordance with the various subordinate fluvial systems which make up the whole Congo basin, one being devoted to the region of the Sangha, another to the middle Ubangi, a third to the upper Congo between 6° S. and 2° N. with the parallel course of the Lomani, and so on. It is, however, apparently intended that

the separate sections shall combine without overlapping to form a complete map of the whole state, which, as all available material has been carefully worked up, will prove of much value. The sheets already issued are to be found in the numbers for December 8, 1895; February 2, May 24, August 16, and October 11, 1896.

Discovery of a Fishing Bank near the Azores.—Prince Albert of Monaco reports that while cruising this year on his yacht, the *Princesse Alice*, at a point about 55 miles south of the Azores, where depths of 1000 to 1500 fathoms were expected, the lead touched the bottom at a depth of only 790 feet. A thorough examination of the neighbourhood was made, and it was found that there exists here a bank of 94 miles in circumference, with two culminating points, at a depth of 250 and 625 feet respectively. The bank, which was named the *Princesse Alice* bank, was found to be remarkably rich in fish, and is thus likely to create a new industry for the inhabitants of the Azores.—*Petermanns Mittheilungen*, November, 1896.

Mr. Ormerod's Paper on the Tana River.—In this paper in vol. viii. of the *Journal*, p. 287, line 5, for *snakes* read *ducks*.

AMERICA.

Fixed Positions in the United States.—Mr. Henry Gannett, chief topographer of the United States Geographical Survey, has compiled as Bulletin No. 123 of the Survey's publications a dictionary of positions in the United States which have been determined with sufficient accuracy to serve for the construction of maps—about ten thousand positions, with latitude and longitude to the second decimal of seconds, and a reference to the authority for the position. The arrangement is particularly interesting, for it shows emancipation from the thralldom of alphabetic order when geographical classification is the object. The states are given in geographical order from north-east to south-west, beginning with Maine and ending with California; and within each state the positions are grouped in degree-squares, *i.e.* in Maine the quadrilateral between 44° and 45° N. and 69° and 70° W. is first taken, all the positions fixed within that square being arranged in alphabetical order. In the case of Rhode Island a single degree-square includes the whole list; but in the case of Texas there are about seventy. Besides a full index, the list is provided with a map of the United States divided into degree-squares, each bearing the number of the page on which the places contained in it are catalogued.

Exploration in the Chilean Archipelago.—The Chilean navy has resumed exploration in the southern archipelago of the country, and, as it had previously been ascertained that the supposed single islands of Chonos and Wellington were in reality composed of several islands, so this has now been proved to be the case also with Queen Adelaide island, as is shown on the Chilean naval chart No. 65.—*Petermanns Mittheilungen*, 1896, No. x.

M. Coudreau's Expedition to the Xingu.—M. Coudreau, already well known for his explorations in Guiana, has started on an expedition up the Xingu river, with a view to completing von den Steinen's map, especially with regard to the main tributaries. In a letter to M. Reclus, the substance of which is published in the *Scottish Geographical Magazine* for September, the traveller announces that he has already passed the great bend ("volta") of the lower Xingu.

AUSTRALASIA AND OCEANIC ISLANDS.

Sir W. Macgregor's Journey across New Guinea.—The following telegram from Sir W. Macgregor to the Governor of Queensland, announcing the

completion of a journey across New Guinea, appears in the *Brisbane Telegraph* of October 27. "Without loss of life or limb, I have crossed New Guinea from the mouth of the river Mambare to the mouth of the river Vanapa. I followed the Mambare to the foot of Mount Scratchley, on the top of which I took observations with a small theodolite. I found an easy road westward on Stanley range. Without descending the range, I reascended Mount Victoria to take observations, but without success, the day being unfavourable. I descended Mount Knutsford, and found no difficulty in reaching the coast. Miners have been at work at the foot of Mount Scratchley, probably the whole of which is auriferous. The Wharton chain connects Mount Scratchley with the great Mount Albert Edward, which is also well inside British territory. All these great mountains seem to be composed of slate quartz. No natives were encountered between the government station and Mount Scratchley, but on Mount Scratchley there is a very friendly tribe. Excellent relations were maintained with the natives from Mount Knutsford to the coast. During the whole journey we had scarcely a single completely dry day. I would strongly dissuade any travelling towards the interior before April or May." The general direction of Sir W. Macgregor's route may be followed in the map accompanying his paper on the ascent of the Owen Stanley range (*Proceedings R.G.S.*, vol. xli. 1890, p. 256), the stream seen on that occasion between Mount Parkes and Mount Gillies being apparently the Mambare.

The German Expedition to New Guinea.—Dr. von Danckelman sends us a preliminary account of the recent expedition in German New Guinea under Dr. Lauterbach, who arrived in Berlin early in December. The early stages of the expedition were described in the December number of the *Journal* (p. 841), so that we may take up the thread of the narrative from the reunion of the party on July 2, after the final return to the coast for supplies. The westward-flowing stream already discovered was followed for a further distance of 15 miles, its direction changing to north-west. On reaching the plain, which had been seen from the summit of Mount Siguan, at the source of the Elisabeth,* the travellers left the river and proceeded south-westwards by native paths through a fine forest, and subsequently through extensive woods of sago-palms. On July 10, a large river flowing north-west was reached. It had a breadth of over 100 yards, carried a large body of water, and was navigable. An encampment was formed at the foot of the Bismarck range, and the work of building canoes commenced. Fifteen were ready by August 2, and on August 3 the voyage down the stream began. It first flows 125 miles towards the north-west, and then bends round to the north. The Bismarck range approaches at times close to its left bank, in spurs from 3000 to over 6000 feet high. From this side, too, it receives a large number of copious tributaries. Towards the north-east and north the land is level. At first the population on the banks was small, but later on the expedition was repeatedly attacked in the boldest manner. On August 11, a region thickly peopled by an intelligent tribe was reached. Large groves of coconut palms lined the banks, and the natives dwelt in large, long buildings raised on piles. They were very friendly and communicative. The sea-shells seen among their ornaments proved that they had relations with the coast. By August 15 the stream had attained a breadth of 250 to 350 yards, and a return was resolved on. This was very difficult on account of the strong current and the large amount of driftwood, but the camp was again reached on September 3. From it Drs. Lauterbach and Kersting ascended a spur of the Bismarck range, which rose to a height of about 3500 feet, and afforded a wide view

* This is now spoken of as a tributary of the Gagol, not as the main branch.

to the south, west, and north. The stream, which was known as Yagei in the neighbourhood of the Bismarck range, and lower down as Ramu, is apparently identical with the Outlier.* It was visible, with no diminution in size, for a distance of 60 miles towards the south-east. A plain 20 miles wide extends behind the Finisterre mountains along the foot of the Bismarck range—the position of which on our maps must be shifted some 60 miles towards the south-west—as far as the hills on the right of the Augusta river, where, having attained a width of 60 miles, it bends northwards. The ranges north of the Gogol, which run parallel to the coast and reach a height of 3500 to 6500 feet, pass gradually into the plain towards the south. There are only low lines of hills between the plains of the Gogol and Ramu. The surface of the latter consists throughout of a loamy alluvial soil rich in *humus*, with a substratum of clay. It is everywhere clothed with forest, and is well peopled. Snow was seen at times on the highest peaks of the Bismarck range, which are far above 13,000 feet high. The return march was begun on September 8, and on the 16th the expedition reached Stephansort in the best of health. Only two porters lost their lives during the journey by an accident.

The Inhabitants of New Guinea.—Dr. Loria, an Italian scientific traveller, who has spent seven years in British New Guinea, and is now returning to Italy, has come to the conclusion that no pure Papuan race exists in the island. The great physical variety noticeable among the inhabitants points, he thinks, to their being a mixture of several races. Dr. Loria met with traces of gold everywhere, and thinks it probable that it exists in quantities which would pay working.—*Petermanns Mittheilungen*, No. 11.

A Journey in Western Australia.—We learn from a telegram that the Hon. David W. Carnegie has completed a journey from Coolgardie in a north-north-easterly direction, passing over much new ground, to the Kimberley goldfields and Derby, at the mouth of the Fitzroy river.

An Oasis in Western Australia.—A note in the November number of *Petermanns Mittheilungen* records that Mr. Mann, of Sydney, who had gone to Eucla in Western Australia to hunt the rabbits which have multiplied in that neighbourhood with extraordinary rapidity, discovered a magnificent oasis of apparently considerable extent, in a region hitherto regarded as entirely composed of sandy desert. The soil was chocolate to red in colour, and covered with luxuriant grasses and many flowers, and was well adapted for tropical products. Open water was nowhere to be seen, but in the short time Mr. Mann was there about 4 inches of rain fell.

Discovery of a Harbour in North Australia.—It is reported that a fine harbour hitherto unknown, bearing much resemblance to Port Jackson, has been discovered on the north side of Melville island. It lies opposite Karalake island in 11° 17' S., 130° 40' E.—*Petermanns Mittheilungen*, November, 1890.

POLAR REGIONS.

Proposed Swedish Polar Expedition.—In *Ymer* (vol. xvi., 1890, p. 267, et seq.) Dr. A. G. Nathorst has a paper on the present state of Polar research and a proposed Swedish expedition, which he read before the Swedish Anthropological and Geographical Society on November 20, 1890. After reviewing the attempts to reach the North Pole from Parry's to Nansen's time, the author proceeds to point out the geological, botanical, zoological, hydrographical, and meteorological

* A stream which enters the sea in Broken Water bay, just east of the Empress Augusta river.

researches still awaiting completion in the Polar Regions already known; and then lays before the Society his project for a scientific Polar expedition to the east coast of Spitzbergen and King Karl's Land. The two islands, separated by a narrow sound, which bear the name of "King Karl's Land," were seen by Nordenföld and Dønér from the top of the Hrita Berget (White Mountain) on Spitzbergen on August 22, 1864, and identified by them as the land seen by Gillies in 1707; but as the condition of the ice was very unfavourable, they were not able to reach it. On August 17, 1872, Captain Nils Johnsen from Tromsø succeeded in landing on the eastern island, and in the same year it was closely approached by two other captains. The islands were sighted by whalers in 1884 and 1898; but it was only on August 18, 1889, that Captain Hemming Andreassen, of the ketch *Rindalen*, succeeded in landing on the west island for the first time. Captain Andreassen's observations on the island, accompanied by a map, were published in *Nær* for 1889. According to Captains Nils Johnsen and H. Andreassen, King Karl's Land abounds with reindeer, and is very interesting from a geological and botanical point of view. The staff of the proposed expedition is to consist of the following members: the leader (geologist and botanist), one geologist, one botanist, one zoologist, one hydrographer-meteorologist, and one cartographer-photographer. Mr. Nathorst's plan is as follows: In the beginning of June the expedition is to reach the east coast of Spitzbergen and survey the state of the ice. As it is very unlikely that its condition at that time of year will be favourable for the expedition to proceed eastwards, it will commence operations on Spitzbergen. Later on in the summer, when the condition of the ice will probably be more favourable, the expedition is to proceed to King Karl's Land, and from thence to Ny (New) Island, and any others that may exist between Spitzbergen and Franz Josef land. The best time for undertaking this voyage will be between the latter half of August and the beginning of September, by which time all the scientific researches on Spitzbergen will be finished. In Dr. Nathorst's opinion, it is very improbable that the condition of the ice will be such as to prevent the expedition from landing on either King Karl's Land or Ny Island, provided the expedition goes out with a steamer of 200 or 300 tons burden, of the Norwegian sealer or whaler pattern; but, in any case, Mr. Nathorst is confident that the scientific results obtained from Spitzbergen alone will amply repay the cost of the expedition, which will amount to between 70,000 and 75,000 kroner, or about £4000. A considerable sum has already been promised by one of the members, and Dr. Nathorst is confident of obtaining the remainder. The paper is accompanied by three sketch-maps, two of which show King Karl's Land according to different authorities.

Peary's Expedition to Greenland.—Lieut. Peary arrived in September at Sydney, Cape Breton, on his return from his Greenland Expedition of 1896. He has not brought back the celebrated Cape York meteorite, but is said to have been successful in his ethnological and other researches, which formed an important part of the plan of his expedition.

Danish Surveys in the Neighbourhood of Greenland and Iceland.—The Danish man-of-war *Infatig* has returned from a four months' cruise, by which the hydrographical survey of the Danish water of Greenland and Iceland has been completed. The most important discovery reported is that of a submarine volcanic ridge running out to sea for at least 50 miles from Cape Reykjanæs, the south-west point of Iceland, at a depth of only from 200 to 300 feet below the surface of the sea.—*Petersmanns Mittheilungen*, November, 1896.

Botany of Franz Josef Land.—Dr. A. G. Nathorst, with reference to the statement of Mr. H. Fisher on p. 540, vol. viii. of the *Journal*, that *Pleuropogon*

Sabini does not occur in Greenland, informs us that it was discovered at Cape York in 1883 (see *Öfversigt af Vetensk. Akad. Förhandling*, 1884, No. 1, Stockholm).

Icebergs in the South Indian Ocean.—The mail steamer *Tongariro* lately passed no fewer than 200 icebergs, some of them of great size, between 45° S. lat., 50½° E. long., and 47° S. lat., 70½° E. long. As icebergs are rarely seen in these latitudes, it appears that the ice has recently advanced unusually far north.

OBITUARY.

Admiral Sir George H. Richards, K.C.B., F.R.S.

By the death of Admiral Sir George Richards, which took place at Bath on November 14, the Society loses an old and valued member, who for many years took an active interest in its affairs, and who, during his professional career, did much to further the interests of the science with which it is specially concerned. He had been a member of the Society for thirty-nine years, and served on its Council almost continuously during the eleven years from 1867 to 1877—during three of them as Vice-President.

The deceased admiral, who was the son of Captain G. S. Richards, R.N., entered the navy in 1832, at the age of twelve years, having been born in 1820. His connection with maritime exploration, in which he subsequently took a prominent part, began only three years later, for in 1835, after two years' service in the West Indies, he was appointed midshipman in the *Sulphur*, one of the two ships despatched under Admiral Beechey (replaced in 1836, owing to ill health, by Sir Edward Belcher) on a surveying expedition to the Pacific Ocean. Richards served five years in the *Sulphur*, during which time extensive surveys were carried out, both on the western coasts of America and among the islands of the Pacific, one part of the programme consisting in the determination of the position and height of Mount St. Elias. Being transferred to the *Stirling* in 1840, he took part in the operations of the first China war. In 1842 he became lieutenant, and joined the *Philomel* for the survey of the Falkland Islands, under Admiral Sir R. J. Sullivan. That ship was, however, soon summoned to take part in the naval operations on the Paraná and Uruguay rivers in 1845-46, in which service Lieut. Richards highly distinguished himself on several occasions, and was promoted to the rank of commander in 1846. From 1848 to 1852 he served under Admiral Stokes on the survey of the coasts of New Zealand. On his return home in the latter year, the Franklin Search Expedition, under Sir Edward Belcher, was fitting out, and Commander Richards was appointed to the *Assistance*, Belcher's own ship, the other three ships of the expedition being commanded respectively by Captains Kellett, McClintock, and Sheridan Osborn. The *Assistance* proceeded up Wellington channel, in company with the *Pioneer*, to 76° 52' N. lat., and the crews wintered in Northumberland sound, whence Richards explored the neighbouring channels by various sledging expeditions, during which he travelled more than 2000 miles over the ice. On his return to England in 1854, he was promoted to the rank of captain.

From 1856 onwards Captain Richards carried out extensive surveys of Vancouver Island and adjacent coasts, whilst in command of the *Plumper*, and afterwards of the *Hecla*. During this time he acted as one of the commissioners for the settlement of the Oregon boundary question with the United States. The return voyage to England in 1863 was made across the Pacific and by Australia and Torres straits, surveys being carried out en route. On his arrival, Captain Richards was

appointed Hydrographer to the Admiralty, the duties of which post he performed efficiently for more than ten years. In 1875 he presided over the committee which examined into the question of the renewal of Arctic exploration. He became rear-admiral in 1870, vice-admiral in 1877, and admiral in 1884, and was made K.C.B. in 1898, having been C.B. since 1871. From 1874 onwards he was on the retired list, and during this time he took an active part in the promotion of telegraph communication in various parts of the World, occupying the post of managing director of the Telegraph Construction and Maintenance Company for some years.

In 1875, Sir George Richards read a paper (printed in the *Proceedings* of the R.G.S. for that year) on the route for the Arctic expedition then fitting out, and often took part in discussions on Arctic questions. He assisted in the compilation of sailing directions for the coasts of Vancouver Island and New Zealand, and was the author of reports on the navigation of the Mersey, of which he was acting conservator. He was twice married—in 1847, and again after the death of his first wife in 1881.

William Francis Ainsworth, Ph.D., F.S.A.

The last of the 450 Fellows whose names appeared on the first list of the newly formed Royal Geographical Society in 1830 has been removed by death, in the person of William Ainsworth, who is best known to geographers for the part which he took in the great Euphrates expedition of 1835–37, a personal narrative of which he published as recently as 1888.

William Ainsworth came of an ancient Lancashire family, being the son of Captain John Ainsworth, 15th and 129th Regiments, of Roosthorne in that county, and first cousin to William Harrison Ainsworth, the novelist, and Dr. Ralph Ainsworth, of Manchester. He was born in 1807, at Exeter, and, after studying in London, Paris, Brussels, and Edinburgh, qualified as L.R.C.S. in 1827. He continued his studies at the School of Mines in Paris, and gained practical experience in geology—the branch of science which he represented on the Euphrates expedition—in the mountains of Auvergne and the Pyrenees. In 1829 he became co-editor of the *Edinburgh Journal of Natural and Geographical Science*, and having visited Sunderland in 1832 for the purpose of studying the cholera epidemic in that town, he became surgeon to the Cholera Hospital at St. George's, Hanover Square, and at several places in Ireland, in 1833. His double qualifications as surgeon and geologist led to his appointment in 1835 to the Euphrates expedition, under Colonel Chesney, from which he returned in 1837 through Persia, Kurdistan, the Taurus, and Asia Minor, publishing as the result of his observations 'Remarques en Assyria, Babylonie, and Chaldée,' in 1838. His next journey was undertaken in behalf of the Royal Geographical Society and the Society for Promoting Christian Knowledge jointly, its object being to open intercourse with the Nestorian Christians and to study their country. He was accompanied in it by Mr. Rassam, with whom he explored part of Asia Minor, and proceeded to Mosul and Kurdistan in 1839. Much geographical information was collected and magnetic observations taken en route, and the results were published under the title, 'Travels in Asia Minor, Mesopotamia and Armenia,' in 1842. This was followed in 1844 by 'Travels in the Track of the Ten Thousand Greeks;' whilst the questions of 'The Euphrates Valley Route to India' and 'An Indo-European Telegraph by the valley of the Tigris' (since an accomplished fact), were subsequently discussed in pamphlets. Among other publications, Mr. Ainsworth edited 'All round the world' and the 'Illustrated Universal Gazetteer.' Besides the 'Personal Narrative of the Euphrates expedition' already mentioned, he lately published a little book on the river Karun.

Mr. Ainsworth was elected a Fellow of the Society of Antiquaries in 1853, and maintained the connection until his death. He was associated with many other learned societies, being a corresponding member of the Paris Geographical Society, and for many years honorary secretary of the Syro-Egyptian Society. He was one of the founders of the West London Hospital, and took an active interest in the political and parochial affairs of Hammer-smith, in which he long resided. He was of a very generous and kindly disposition, always ready to help those in distress, and to impart information to inquirers from all parts of the world. One son and two daughters survive him.

D. Martin Ferreiro.

We have to register with much regret the death of Señor Martin Ferreiro, the Director of the Hydrographic Service of the Madrid Naval Department, and, for many years, the Secretary of the Madrid Geographical Society. His geographical work is very extensive and valuable. He was one of the contributors to the well-known maps of Spain by Colonel Francisco Ocello, and to the '*Diccionario Marítimo y de Mareas*,' by Señor Murga y Lorenzo. He was himself the author of an '*Atlas Geográfico de España*' (58 maps, 1864); of an '*Historical Map of Spain in the fourteenth century*,' published for the Gotha Institute; and of numerous other contributions to Spanish and foreign geographical publications. He founded in 1880—and had been the active promoter ever since—the Spanish society for the rescue and protection of shipwrecked sailors (*Sociedad de Salvamento de Naufragos*). He used, during recent years, to give a course of lectures on geography at the Madrid Society for the Instruction of Women, and leaves ready for publication a treatise on the same science.

Edward Lavington Oxenham.

Mr. Edward Lavington Oxenham, whose death took place on September 26, was the son of the Rev. William Oxenham, of Harrow School. He was born on September 30, 1843, and was educated at Harrow and Magdalen College, Oxford. In 1866 he entered H.M. Consular Service, and went out to China as a student interpreter. Having risen through the usual grades, he became acting interpreter at Newchwang in 1870, and afterwards successively at Hankau, Puchau, and Taiwan. He was appointed H.M. Consul at Chinkiang in 1880, being transferred to Kiungchau in 1888, and Ichang in 1890. Bad health necessitated his retirement at the end of the same year. His first leave in 1873 was spent at Oxford, and his second in reading for the Bar at the Middle Temple. He was called in 1883. Some of his reports were of the greatest value, especially his report of a journey overland from Peking to Hankau, which was printed in 1880 (*Parl. Blue Book*), and received the highest praise from Sir Rutherford Alcock, H.M. Minister to China. It is frequently quoted by Sir Henry Yule, in his edition of Marco Polo. Mr. Oxenham was elected a Fellow of the Society in 1873, and in 1875 he contributed a paper "*On the Inundations of the Yang-tse Kiang*," which was read in April of that year, and which contained much valuable and interesting information. In 1879 and 1888 he contributed notes on the climate of Central China, and the overflow of the Yellow river, to the *Proceedings*. In the latter year he published his '*Historical Atlas of the Chinese Empire*.'

As a consul he was esteemed wherever he was stationed. He was a Chinese scholar of great ability, and his method of expending his leave in the pursuit of knowledge is characteristic of him. His death is deplored by all who knew him.

CORRESPONDENCE.

Ixtaccihuatl and Popocatepetl.

Academy of Natural Sciences, Philadelphia, October 31, 1896.

PERMIT me to add a few lines to the correspondence which has already appeared in the *Journal*, following the paper by Mr. O. H. Howarth, on the volcanoes of Mexico. I believe that up to the present time but three ascents of Ixtaccihuatl have been made: those of De Salis and Whitehouse in November, 1889, and my own (with my associate, Mr. Frank C. Baker) in April, 1890. A statement of the latter is contained in my paper, "Barometric Observations among the High Volcanoes of Mexico, with a Consideration of the Culminating Points of the North-American Continent," published in the *Proceedings* of the Academy of Natural Sciences of this city for the year 1890.

Mr. Howarth, referring to Ixtaccihuatl, says it "is very difficult of access, and, being nearly 2000 feet lower than Popocatepetl, does not offer to the ordinary climber the same inducement to attempt it" (*Geographical Journal*, August, 1896, p. 140). In my paper above referred to, I give the result of my barometric measurement of altitude—16,960 feet, an agreement within a few feet of the (corrected) value obtained by Sonntag by triangulation as early as 1857 (*Smithsonian Contributions to Knowledge*, xi.), and approximating within 600 feet the height of Popocatepetl. It may be of interest to know that I have since recomputed (and confirmed) the altitude, comparative with Popocatepetl, on a photographic sheet showing the two summits, and with views taken from a single spot and from almost exactly equal distances.

Mr. H. T. Munro (*Geographical Journal*, September, 1896, p. 305) has properly criticized Mr. Howarth's statements that the so-called "'region of eternal snows' on the great summits is somewhat mythical," and that there is "no 'snow-line' even on Popocatepetl." The snow-line is about as clearly defined as on any other high summits, and the fact that one side of it is frequently "burned" out for a height of 2000 feet by the summer sun and by the vapours which flow out from the lip of the crater does not alter this condition. It is, however, true that the snow is of only inconsiderable thickness. On Ixtaccihuatl the condition is very different, for we not only have there a ponderous ice-cap, but extensive glacial sheets descending from it—a truly Alpine feature.

Mr. Munro calls attention to the ice-cliffs and schrunds described by Whitehouse, and to one of the main ice-sheets, with its vast crevasses, I had already in 1890 given the name of Porfirio Diaz glacier. As regards the geological character of Ixtaccihuatl, I am confident—although opposed in this view by Felix and Lenk—that it is a true volcano, one that has been dismantled by crateral subsidences and summit disruptions, and it bears evidence of having been at one time perhaps 2000 to 3000 feet higher than it is at present. The disruption on the Puebla side is clearly defined in the plunging precipice, carrying the overhanging cornice of snow and ice, which faces that city. The contour of the mountain is to-day very similar to that of Antisana, of the equatorial Andes.

As regards the great east-and-west fissure upon which the principal volcanoes of Mexico are supposed to be situated or implanted, I trust that I may be permitted to express a doubt as to its existence in fact.

ANDRÉO HEIFRICH.

Stockholm, December 15, 1896.

"Gilles Land."

In his interesting paper on the Jackson-Harmsworth Polar Expedition (*Geographical Journal*, December, 1896) Mr. Montefiore Brice has some remarks on "Gilles Land." He says that it was sighted in 1863 by Captain Carlsen, and 1864 by Captain Tobiesen; but the fact is that the land which was seen by them is what is now known as "Kung Karls Land" (King Charles' Land), and in about 76° N. lat. (*Petermanns Mittheilungen*, 1873, p. 121). Carlsen and Tobiesen saw it from the south-east part of North-East Land in east-south-east. In consequence of the Norwegian seal and walrus shippers at that time generally identifying King Charles' Land with Gilles Land, the mistake is, however, very pardonable.

The true "Gilles Land" has, during the last twenty years, been seen at least twice from the vicinity of the north-eastern point of North-East Land. In 1876 Captain Kjeldsen of Tromsø saw a lofty land in 80° 15' N. lat. and about 32° E. long. This land he named "Hvide ø" (the White Isle), and in 1883 it was again seen by Captain Sørensen of Tromsø from Outer Rep's Isle (*Ymer*, 1884, p. 87). Then it was again seen in 1887 by Captain E. H. Johannessen of Tromsø, and was named by him "Ny Island" (New Iceland). The south-western point of the land is, according to him, situated in 80° 10' N. lat. and 32° 3' E. long., and from thence the west side of it goes in a north-easterly direction, while its southern coast is described as going straightly against east. The land is said to have an elevation of about 2000 feet, and to form a high plateau entirely covered by snow and ice. This description harmonizes perfectly with the character of Cape Mary Harmsworth as described by Mr. Jackson, which is also quite natural, if this is situated in the eastern part of the same land.

The position of New Iceland is given on the sketch-map, p. 180, in *Ymer*, 1887, and also on the little sketch-map, p. 280, in *Ymer*, 1890, which has lately been published by myself in connection with my paper on the new Swedish scientific expedition to the eastern part of Spitzbergen and King Charles' Land (see p. 95, *supra*). If the ice-pack will not be too heavy, I hope then also to be able to visit New Iceland, in order to determine its position more exactly than has hitherto been done, and to examine its geology and natural history.

A. G. NATHORST.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY,
SESSION 1896-97.

Third Ordinary Meeting, December 7, 1896.—SIR CLEMENTE MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—Julian B. Arnold; Godfrey Rathbone Benson; John Stuart Black; James McCrea Brigham; John Henry Clarke, M.D. Edin.; Walter Barthwick Cracknell; W. W. A. Fitzgibbon; Sidney Flemming; J. K. Foster; Edward William Percival Foster, C.N.; Vincent W. Calmady Hamlyn, M.A.; David George Hogarth, M.A.; Samuel Thurley Thomas James; Williamson Lamplough; Lieut. Arthur C. Leveson, R.N.; Lord Lilford; David Michael Lister; Frederick Palmer; Surgeon-Major Henry John Robbins; John Robert Tustin; John Owen Unwin.

THE PRESIDENT: We must not, I think, pass over in silence the loss of the last of the original members of the Royal Geographical Society, Mr. Ainsworth, who

died last month at a good old age. He was very well known to this Society in former days as one of the most active members of the Chesney Euphrates Expedition, and as commanding an expedition, fitted out and paid for by the Society, into Kurdistan. When we celebrated our fiftieth year in 1880, there were fourteen original members living; now there is not one.

The arrangements with regard to the Nansen meeting are progressing very favourably in so far as the names of the members who want to be present is concerned, and I believe we may promise that there will be a place for every Fellow of this Society. I hope, too, that nearly every Fellow will be able to bring a friend, and that they will all have good places, and be able to hear and see. I can only say that we shall spare no efforts to make everybody as comfortable as possible.

We have just lost, I trust only for a short time, one of our Vice-Presidents, Sir George Goldie, who has sailed for the mouth of the Niger, and I think I must tell you what his last wishes were. He was particularly anxious that all members of this Society, and all who are connected with it, should make up their minds to spell "Hausa" correctly. Of course the Fellows of this Society all do spell it correctly, but perhaps they will ask their friends to spell it "H-a-u-s-a," and in no other way.

The Paper read was:—

"A Journey to the Sources of the Niger." By Colonel J. K. Trotter, R.A.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian, R.G.S.*

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.

Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Rivista.
S. = Society, Société, Seiskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 x 6½.

EUROPE.

Arctic Europe, etc. *Quarterly J. Geol.* **S. 52** (1896): 721-747. **Feldten.**
Notes on the Glacial Geology of Arctic Europe and its Islands. Part II. Arctic Norway, Russian Lapland, Novaya Zemlya, and Spitzbergen. By Col. H. W. Feldten. With an Appendix by Prof. T. G. Bonney, *etc.*, etc. *With Illustrations.*
An interesting paper illustrated by admirable photographs taken by Mr. H. J. Pearson.

Austria. **Raffelsberger.**
Das Niederösterreichische Waldviertel. Von Dr. Ernst Raffelsberger. Separat-

tabdruck aus dem Berichte über das XIX., XX., XXI. Vereinsjahr des Vereines der Geographen an der Universität Wien. Wien, 1896. Size $9\frac{1}{2} \times 6$, pp. 134.

Austria—Bosnia and Herzegovina. *Globus* 70 (1896): 202-203. Hoernes.
Bosnien und die Herzegovina in Vergangenheit und Gegenwart. III. Von Dr. Moriz Hoernes. With Illustrations.

Austria—Carniola. *Deutsche Rundschau* G. 19 (1896): 21-30, 60-75. Petkovsek.
Das Laibacher Moor in Krain. Von Johann Petkovsek. With Map and Illustrations.

Austria—Riesengebirge. Peucker.
Morphometria der Koppenteiche. Von Dr. Karl Peucker. Wien: Sonderabdruck aus dem "Wanderer im Riesengebirge." Hirschberg L. Schl. Druck von J. Schmidt. Size $8\frac{1}{2} \times 6$, pp. 16. Presented by the Author.

Austria—Tyrol. Sinigaglia.
Climbing Reminiscences of the Dolomites. By Leone Sinigaglia. With Introduction by Edmund J. Garwood. Translated by Mary Alice Vialla. London: T. Fisher Unwin, 1896. Size $10 \times 7\frac{1}{4}$, pp. xxiv. and 221. Map and Illustrations. Price 21s. Presented by the Publisher.

This is a copiously illustrated record of climbing in the group of dolomite mountains accessible from Cortina. It abounds in adventure amongst the cliffs, and gives some interesting observations of the general character of the country from the mountaineer's standpoint. Some of the illustrations are remarkably fine, others are by no means satisfactory.

Balkan Peninsula. Miller.
The Balkans, Roumania, Bulgaria, Servia, and Montenegro. By William Miller. (The Story of the Nations Series.) London: T. Fisher Unwin, 1896. Size $8 \times 5\frac{1}{2}$, pp. xx. and 476. Maps and Illustrations. Price 5s. Presented by the Publisher.

This history of the Balkan states north of the present border of Turkey introduces one of the most interesting of the problems of historical geography; but even a well-written book like this would have derived both additional interest and value if it had been equipped with a good series of historical maps.

Denmark. Oerstedt K. *Danske Vidensk. S. Forhand* (1896): 375-404. Steenstrup.
Nogle Undersøgelser Danmarks ældste Inddeling. Af Johannes C. H. R. Steenstrup. With Maps.

The map shows the oldest territorial subdivisions of the old kingdom of Denmark, provinces and parishes.

Denmark—Meteorology.
Meteorologisk Aarbog for 1894. Udgivet af det danske meteorologiske Institut. Første Del. Kjøbenhavn, 1895. Size $14 \times 9\frac{1}{4}$, pp. vi. and 140.

Europe. G. *Tidsskrift* 18 (1896): 156-163. Mehlahl.
Iagttagelser paa en Rejse i Mellem- og SydEuropa. Ved Kammerherre, Professor ved Kunstakademiet Mehlahl.

Europe—Geodesy. Börsch and Krüger.
Veröffentlichung des Königl. Preussischen Geodätischen Institutes und Centralbureaus der Internationalen Erdmessung. Die Europäische Längengradmessung in 52 Grad Breite von Greenwich bis Warschau. II. Hoff. Geodätische Linien, Parallebogen und Lothabweichungen zwischen Fencheln und Warschau. Von A. Börsch und L. Krüger. Berlin: P. Stankiewicz, 1896. Size $11\frac{1}{2} \times 9$, pp. viii. and 206.

Europe—Lakes. G. Z. 2 (1896): 606-616. Peucker.
Europäische Seen nach Meereshöhe, Grösse und Tiefe. Zusammengestellt von Dr. K. Peucker. Also separate reprint. Presented by the Author.

An alphabetical list of 234 lakes in Europe, giving their height above sea-level, area, greatest and mean depth, and volume, with the name of the authority, and an indication of those of which a bathymetrical map has been published.

France. B. *Union G. Nord de la France* 17 (1896): 1-11. Benoit.
Revue de l'histoire de la Géographie de la France avant notre siècle. Par M. François Benoit. With Maps.

ASIA.

Armenia.

Hodgetts.

Round about Armenia, the Record of a Journey across the Balkans, through Turkey, the Caucasus, and Persia in 1895. By R. A. Brayley Hodgetts. London: Low & Co., 1896. Size 8 x 5½, pp. xii. and 296. Map and Frontispiece. Price 6s. Presented by the Publishers.

An account of the travels of the *Daily Graphic's* special correspondent in Armenia in 1895, undertaken with the object of investigating the condition of the people. There is, therefore, a good deal of political matter in the book, combined with brief descriptions of places visited and the modes of travelling available at the present time.

Asia.

B.S.G. Madrid 38 (1896): 57-74, 151-152.

Sobral.

Asia. Por D. José Gutiérrez Sobral.

Asia Minor.

Paton, Myres, and Hicks.

Three Karian Sites, Telmessos, Karyanda, Tarampton. By W. R. Paton and J. L. Myres. Inscription from Telmessos, by E. L. Hicks. Reprinted from the *Journal of Hellenic Studies*, vol. xiv., 1894. Size 11 x 7½, pp. [8]. Illustrations.

Asia Minor.

Paton and Myres.

Karian Sites and Inscriptions. By W. R. Paton and J. L. Myres. Reprinted from the *Journal of Hellenic Studies*, vol. xvi., 1896. Size 11 x 7½, pp. [48]. Plans and Plate.

Central Asia.

Globe 70 (1899): 297-302, 311-315.

Die Forschungsreisen von Dutrouil de Rhins in Centralasien. With Portrait and Illustrations.

China.

Obratshew.

Aus China. Reiseerlebnisse, Natur- und Völker-Bilder. Von W. Obratshew. 2 vols. Leipzig: Duncker & Humblot, 1896. Size 8½ x 5½, pp. (vol. i) viii. and 262; (vol. ii) viii. and 290. Map. Price 8s.

This German account of the Russian expedition in China under Potanin is written by the geologist. It takes the form of a direct narrative of the two-year journey in the north of China and Central Asia, including the Nan-shan mountains.

China.

Martin.

A Cycle of Cathay: or, China, South and North, with Personal Reminiscences. By W. A. P. Martin, v.m., etc. Edinburgh and London: Oliphant, Anderson, & Ferriar, 1896. Size 8½ x 6, pp. 164. Map and Illustrations. Price 7s. 6d.

Dr. Martin's authority as a writer on China is of the highest kind. His book deals mainly with the character of the people, and is divided into two parts relating respectively to North and South China. The illustrations are particularly fine, some being reproduced from native drawings, and some from the superb photographs of Mr. John Thomson.

China.

Ann. Hydrographie 24 (1896): 466-476.

(Scholtz.)

Die Sprungwelle in der Mündung des Talientung Kiang (Haug-tshan-Bucht). With Illustrations.

A description of the bore in the Tairen-tang-kiang is given with views taken at Haining.

China.

B.S.G. Commerce. Paris 12 (1896): 808-813.

Brenier.

Du Tonkin, considéré comme voie de pénétration vers le Sze-Tchouan. Par M. H. Brenier.

French Indo-China—Annam.

Mercié.

Exploration en Annam et au Laos de Haï à Kémarat. Par Mercié. Extrait de la *Nouvelle Revue* du 1^{er} Août 1896. Paris: Librairie de la 'Nouvelle Revue,' 1896. Size 10 x 6½, pp. 12. Presented by the Author.

India.

J.S. Arts 45 (1899): 6-14.

Burns.

India: its Arts, Manufactures, and Commerce. By Major-Gen. Sir Owen Tudor Burns.

India—Burma.

Missions Catholiques 28 (1896): 510, 521, 537, 551.

Bringard.

Un chapitre de l'Ethnographie des Birmanes Karins. Par M. J.-B. Bringard. With Illustrations.

India—Himalayas.

Steen.

In and Beyond the Himalayas. A Record of Sport and Travel in the Abode of Snow. By S. J. Steen. Illustrated by Charles Whymper. London: E. Arnold, 1896. Size 2½ x 6, pp. xviii. and 399. Price 16s. Presented by the Publishers.

An exhilarating record of sport during several trips into the northern mountain border of India. Part i. describes markhor, ibex, and bear shooting in the provinces of Anor, in Kashmir. Part ii. recounts experiences in Ladakh and the Chang-cheng-mo district, with some notes as to errors in the Indian survey maps of the country. Part iii. describes a visit to the upper Baspa valley, and thence into a part of Tibet never previously visited by Europeans, and this, while the least successful from a sporting point of view, is the most interesting geographically. There are many curious observations as to the people.

India—Kashmir. *J. Bombay Br. R. Asiatic S.* 10 (1896): 237-248. **Modi.**

Cashmere and the Ancient Persians. By Jivanji Jamshedji Modi.

India—Maldivé Islands. *M.G. Ges. Wien* 30 (1896): 297-337. **Rosset.**

Die 1400 Malediven-Inseln. Von C. W. Rosset.

A summary of the early history of the Maldivé islands, with additions from the personal observations of the author. The date of his visit is not mentioned.

India—Marine Survey.

Administration Report of the Marine Survey of India for the Official Year 1895-96. Bombay, 1896. Size 12 x 8½, pp. 8. Presented by the Marine Survey of India.

India—Railways. *Gracey.*

Administration Report on the Railways in India, for 1895-96. By Colonel T. Gracey. London: Eyre & Spottiswoode, 1896. Size 12½ x 8½, pp. 296. Maps and Diagrams. Price 1s. 3d.

AFRICA.

Africa—German Explorers. *B.S.R. Helge G.* 20 (1896): 331-341. **Peltzer.**

Les Allemands en Afrique. Par J. Peltzer.

A history of German territorial acquisitions in Africa.

Algeria. *Rev. Française* 21 (1896): 625-632. **Demanche.**

Les ressources militaires de l'Algérie. Par Georges Demanche.

British East Africa. *Petermann M.* 42 (1896): 221-231. **Kohl.**

Von Mombasa durch Ukambani zum Kenia. Zwei Expeditionen, 1891-96. Von Georg Kohl. *IFAG Map.*

This is the subject of a separate note.

British West Africa—Gold Coast. *Rev. G.* 33 (1896): 355-365. **Rouire.**

La Côte d'or anglaise. Son origine, son développement, les négociations diplomatiques actuelles. Par le Dr. Rouire.

Congo State. *Mouvement G.* 13 (1896): 553-554.

La navigabilité du bas Congo. *With Map.*

The map is a sketch serving only to show the position of the islands between the sea and Matadi.

East Africa—Somaliland. *B.S. Khediv. G.* 4 B. (1896): 589-602. **Sensia.**

Les explorations italiennes dans le pays des Somalis. Par le Dr. Frédéric Sensia Bey. *With Map.*

East Africa—Somaliland. *Petermann M.* 42 (1896): 215-232. **Paulitschke.**

Reisen des Fürsten Demeter Ghika Comanaghi im Somal-Land 1895-96. Von Prof. Dr. Philipp Paulitschke. *With Map.*

Egypt. *A travers le Monde, Tour du Monde (n.s.)* 2 (1896): 359-372. **Gayet.**

Excursion à Fouad el Natrón. Par M. A. Gayet. *With Illustrations.*

Egypt. **Pollard.**

The Land of the Monuments. Notes of Egyptian Travel. By Joseph Pollard. With Introduction by the Rev. W. Wright, M.A. London: Holder and Stoughton, 1896. Size 8½ x 5½, pp. xvi, and 455. Map and Illustrations. Price 7s. 6d. Presented by the Publishers.

This description of a visit to Egypt is written by a man who had prepared himself by careful study, and knew exactly how to take advantage of his opportunities in visiting the monuments, and how to convey his impressions of travel and his observations of ruins and inscriptions in a simple accurate style which can readily be followed by the unlearned. It includes references to almost all the objects of interest along the Nile from Cairo to Wady Halfa.

- Egypt.** Fiercks.
Ägypten 1894. Staatsrechtliche Verhältnisse, wirtschaftlicher Zustand, Verwaltung. Von A. Ehrh. von Fiercks. Zweiter Theil. Berlin: D. Reimer, 1898. Size 8½ x 6, pp. iv. and 290.
 Deals with law, trade, and commerce in Egypt.
- Egypt—Nile.** B.S. Khalil. (7. 4 8. (1896): 635-654. Groff.
Origine des noms géographiques.—Le Nil Noir. Par William Groff.
 An argument that the name Bahr-el-Azrek, usually translated Blue Nile, should properly be Black Nile; the name being derived from the blackish mud in contrast with the white mud carried down by the Bahr-el-Abiad.
- French Guinea.** *A travers le Monde, Tour du Monde (n.s.) 2 (1896): 361-364. Paroisse.*
Les Plantations dans la Guinée Française. Par M. G. Paroisse. *With Illustrations.*
- French West Africa—Railway.** *B. Comité l'Afrique Française 6 (1896): 332-338. —*
Le chemin de fer du Soudan. *With Sketch-Map and Illustrations.*
 This was referred to in the *Journal* for December, 1896, vol. viii. p. 638.
- French West Africa—Timbuktu.** Dubois.
Tombouctou la Mystérieuse. Par Felix Dubois. *Édition du Figaro.* Paris: E. Planchard, 1897 [1896]. Size 9 x 6, pp. 420. *Portrait and Illustrations.* *Presented by the Author.*
 M. Dubois presents this copy of his valuable work on Timbuktu, with the inscription: "A la Société de Géographie de Londres, en souvenir de Mungo Park et de Laing, hommage de leur grand admirateur et modeste continuateur." The book first describes the journey from Paris to the Niger; gives an account of the Niger valley and its towns, the town of Jene in particular; the Longhol empire; and, finally, as complete an account as possible of Timbuktu and its history down to the French conquest.
- German East Africa.** *M. Deutsch. Schutzgeb. 9 (1896): 184-188. Eick.*
Bericht über meine Reise ins Kwa- und Masumbailand (Usambara), vom 12 bis 16 März 1896. Von Landwirth Eick.
- German East Africa.** *Deutsches Kolonialblatt 7 (1896): 706-709. —*
Ueber eine Expedition nach Ugogo, Irangl, Burungi und Ufiumi.
- German West Africa—Kamerun.** *M. Deutsch. Schutzgeb. 9 (1896): 148-162. —*
Meteorologische Beobachtungen im Kamerungebiet.

NORTH AMERICA.

- Alaska and Canada.** *Scottish G. Mag. 12 (1896): 553-559. Begg.*
Notes on the Yukon Country. By Alexander Begg.
- America—Name.** Thacher.
The Continent of America, its Discovery and its Baptism. An Essay on the Nomenclature of the Old Continents. A critical and bibliographical inquiry into the Naming of America and into the growth of the Cosmography of the New World, together with an attempt to establish the Landfall of Columbus on Watling Island, and the subsequent Discoveries and Explorations on the main land by Amerigo Vesputius. By John Boyd Thacher. New York: W. E. Benjamin, 1896. Size 11½ x 11½, pp. xvi. and 270. *Maps.* *Presented by B. Quaritch, Esq.*
 A sumptuous volume devoted to the problem of determining the time and place of the naming of America. The work is divided into eight parts, dealing respectively with Cosmography, the Discovery of the New World, the life of Vesputius, the Baptismal font of America, the Cosmographic Introduction, Scientific Geography, and the Cartography of the New World. The name is traced to Americus Vesputius.
- Canada.** *Appalachian 3 (1896): 133-153. Fay.*
The Casualty on Mount Lefroy. By Charles E. Fay. *With Illustrations.*
 Gives an excellent description of the climbing of this mountain in the Canadian Rockies.
- Canada—Alberta.** *Trans-Canadian T. 5 (1896): 49-52. Stupart.*
The Climate of Alberta. By R. F. Stupart.
- Canada—Athabasca District.** Grouard.
Mss. Catholiques 23 (1896): 412, 424, 441, 451, 451, 478, 491, 501.
Journal d'un Voyage dans le District Athabasca pour y établir une nouvelle mission, durant l'hiver de 1896. Par Mgr. E. Grouard.

- Canada—British Columbia.** *B. American G.S.* 23 (1896): 220-243. **Boas.**
The Indians of British Columbia. By Dr. Franz Boas.
- Canada—Hudson's Strait.** *Trans. Canadian I.* 5 (1896): 104-113. **Payne.**
The Seasons, Hudson's Strait. By F. F. Payne.
- Canada—Manitoba.** **Marriott.**
To Winnipeg, Manitoba, and Back. By Stephen Marriott. London: Simpkin & Co., 1896. Size $5\frac{1}{2} \times 4\frac{1}{4}$, pp. iv. and 112. Presented by J. Gordon I. Stephenson, Esq.
- Canada—Manitoba.** **Bryce.**
The Historical and Scientific Society of Manitoba. Transaction No. 48. February 11, 1896. Worthless of Old Red River. By George Bryce, LL.D. Winnipeg, 1896. Size $8\frac{1}{2} \times 6$, pp. 12. *Illustrations.*
Contains a map of the Red River settlement in 1818, with portraits and biographical notes of some of the founders.
- Canada—Mountaineering.** *Alpine J.* 13 (1896): 222-236. **Allen.**
Mountaineering in the Canadian Rockies. II. By S. E. S. Allen. With an *Illustration.*
- Canada—North-West Territory.** **Lefthorse.**
Church Miss. Intelligencer (N.W.) 21 (1896): 908-915.
A Thousand Miles on Snow-shoes. Journal of the Rev. J. Lefthorse.
Diary of a winter journey from Churchill to Split lake, on the Nelson river.
- Canada—Quebec.** **Ells and Adams.**
Geological Survey of Canada, G. M. Dawson, C.M.S., Director. Report on a portion of the Province of Quebec, comprised in the South-West Sheet of the "Eastern Townships" Map (Montreal Sheet). By R. W. Ells, LL.D. With a Chapter on the Laurentian North of the St. Lawrence River. By Frank D. Adams, Ph.D. (Part J, Annual Report, vol. vii.) Ottawa, 1896. Size 10×7 , pp. 158. *Map.*
Presented by the Geological Survey of Canada.
- Canada—Rocky Mountains.** **Wilcox.**
Camping in the Canadian Rockies. An account of Camp Life in the wilder parts of the Canadian Rocky mountains, together with a description of the region about Banff, Lake Louise, and Glacier, and a sketch of the early explorations. By Walter Dwight Wilcox. London: G. P. Putnam's Sons, 1896. Size $10\frac{1}{4} \times 7\frac{1}{4}$, pp. xiv. and 284. *Illustrations.* Price 21s.
The illustrations are remarkably fine. The absence of a map is inexcusable. A brief account of Mr. Wilcox's journey is given in the *Geographical Journal*, vol. vii. p. 49.
- Great Lakes.** *Trans. Canadian I.* 5 (1896): 121-127. **Stupart.**
Rainfall and Lake Levels. By R. F. Stupart.
- Lake Ontario.** *Trans. Canadian I.* 5 (1896): 37-43. **Tully.**
The Fluctuations of Lake Ontario. By Kives Tully.
- North America.** **Zeppelin.**
Streifenzüge durch Nordamerika. Von Dr. Max Graf v. Zeppelin. Separatabdruck aus "Vom Fels zum Meer." Stuttgart, 1896. Size $2\frac{1}{2} \times 6\frac{1}{2}$, pp. 84. *Illustrations.*
Presented by the Author.
Notes of the canon-country and the Yellowstone Park.
- United States.** *B. American G.S.* 23 (1896): 251-272. **Gannett.**
A Graphic History of the United States. By Henry Gannett. With *Maps.*
An original piece of work, giving a separate map of each of the present states, showing how its area has been altered, with the date of each rectification of frontier or addition of territory.

CENTRAL AND SOUTH AMERICA.

- Argentine Republic.** **Chaigneau.**
Geografía Náutica de la República Argentina arreglada según los documentos más modernos. Por J. T. Chaigneau. Santiago de Chile, 1896. Size 11×7 , pp. xiv. and 196. Presented by the *Chilian Admiralty.*
An account of the Argentine coast-line from Beagle channel to the river Plata.

Argentina—Buenos Ayres.**Frere.**

Provincia de Buenos Aires. Memoria presentada á la Honorable Legislatura por el Ministro de Obras Públicas Dr. Emilio Frere, 1891-1893. La Plata, 1895. Size $10\frac{1}{2} \times 7$, pp. xli, and 380. *Maps.*

Contains a series of maps showing railways and other public works in the province of Buenos Ayres.

Argentina—Misiones.**Ambrosetti.**

A travers le Monde, Tour du Monde (n.s.) 2 (1895): 273-276.

Les "Misiones" et les Chutes de l'Yguassu (Amérique du Sud). Les voyages scientifiques de M. J.-B. Ambrosetti sur le territoire des Misiones. *With Illustrations.*

Argentina—Tierra del Fuego. Natural Science 9 (1896): 172-181.**Ohlin.**

A Zoologist in Tierra del Fuego: Some Account of the Swedish Expedition, 1895-6. By Axel Ohlin, F.R.D. *With two Maps.*

Bolivia.**Ballivián.**

Diario del Viaje de la Delegación Nacional á los Territorios del Noroeste de la República y el Departamento del Beni. (Notas de enaderneta.) Por Manuel V. Ballivián. La Paz, 1896. Size 9×6 , pp. 76.

Bolivia—India-rubber.**Ballivián.**

Ministerio de Instrucción Pública y Colonización. Apuntes sobre la Industria de la Goma Elástica en los territorios dependientes de la Delegación Nacional en el Noroeste y el Departamento del Beni. Por Manuel V. Ballivián. La Paz, 1896. Size 9×6 , pp. 40 and xiv. *Presented by the Author.*

Bolivian and Chilean boundary. Petermanns M. 42 (1896): 212-214.**Polakowsky.**

Die neuen Grenzverträge Ohlles mit Bolivia und Argentinien. Von Dr. H. Polakowsky.

Brazil.*Petermanns M. 42 (1896): 237-239.***Sievers.**

Der Künftige Distrito Federal Brasileira. Von Prof. Dr. W. Sievers.

Brazil.*Rev. Trim. I.G. e Hist. Bahia 3 (1896): 153-167.*

O Novo Estado do Sal.

Brazil.*Rev. Trim. I.G. e Hist. Bahia 3 (1896): 205-213.*

A Bahia e o Território do Rio S. Francisco. O projecto do senador João Barbalho.

Brazil.*Rev. Scientifique (4) 6 (1896): 233-235.***Cruls**

Le climat du Brésil. Par M. L. Cruls.

Brazil—Parana.*Mem. S.G. Italiana 6 (1896): 80-102.***Antonelli.**

Al Sello Guayrá, relazione di viaggio del socio d'onore Conte Pietro Antonelli. *With Map and Illustrations.*

Contains a number of views of the Guayrá falls of the Parana in Southern Brazil.

Brazil—Parana. B.A. Nacional Ciencias Obislobo 14, 1895 (1896): 331-380. Ambrosetti.

Materiales para el estudio de las lenguas del grupo Kalapangue (Alto Paraná). Por Juan B. Ambrosetti.

British Guiana.*Timuké 10 (N.S.) (1896): 132-150.*

Schomburgkiana.

British Guiana and Venezuela.**Cora.**

Prof. Guido Cora. Il territorio contestato tra la Venezuela e la Guiana Inglese. Lettera aperta al Chiariss. Signor Comm. Dott. Clinio Silvestri, Console Generale degli Stati Uniti di Venezuela in Italia. Roma. Torino, 1896. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. 8. *Presented by the Author.*

British Guiana and Venezuela Boundary.

Venezuela. No. 4 (1896). Further Documents relating to the Question of Boundary between British Guiana and Venezuela. Despatch from her Majesty's Ambassador at Washington, including the First Part of the Brief for Venezuela. London: Eyre & Spottiswoode, 1896. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 12. *Price 2d.*

British Guiana and Venezuela Boundary.

Venezuela. No. 5 (1896). Further Documents relating to the Question of Boundary between British Guiana and Venezuela. Sir R. Schomburgk's Reports. London: Eyre & Spottiswoode, 1896. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 52. *Map. Price 11d.*

- Chile.** *Deutsche G. Blätter* 10 (1896): 108-116. **Polakowsky,**
Zur Auswanderung nach Chile. Von Dr. H. Polakowsky.
On German emigration to Chile.

AUSTRALASIA AND OCEANIC ISLANDS.

- Australia.** *O.Z.* 2 (1896): 576-583. **Jung.**
Der gegenwärtige Stand unserer Kenntnis des Australkontinents. Von Dr.
Emil Jung.
- Australia.** **Calvert.**
The Exploration of Australia from 1844 to 1896. By Albert F. Calvert. London:
G. Philip & Son, 1896. Size 10½ × 8, pp. xiv. and 386. Maps. Price 10s. 6d.
Presented by the Publishers.
A handsome volume provided with a very fine map showing explorer's routes, but
unprovided with an index—a defect which prevents it from serving as a book of
convenient reference. Mr. Calvert, having brought the history of Australian explora-
tion up to date, has sent out an expedition to explore Central Australia, the results
of which will be duly noted in the *Journal*.
- Australia and New Guinea.** **Nisbet.**
A Colonial Tramp. Travels and Adventures in Australia and New Guinea. By
Hume Nisbet. New Edition. London: Ward H. Downey, 1896. Size 8 × 5½,
pp. xxii. and 408. *Illustrations.* Price 6s.
Travels in Australia, Tasmania, and New Guinea form the chief themes of this
volume.
- Australia—Horn Expedition.** **Spencer.**
Report on the work of the Horn Scientific Expedition to Central Australia. Part
I.—Introduction, Narrative, Summary of Results, Supplement to Zoological Report,
Map. Edited by Prof. Baldwin Spencer (pp. xviii. and 220). Part IV.—Anthro-
pology. Edited by Prof. Baldwin Spencer. London: Dulau & Co., 1896. Size
10½ × 8, pp. 200. *Plates.* *Presented by the Publishers.*
The record of the Horn Expedition of 1891 is remarkable both for the amount of
work it records, and the promptness with which it has been published. The whole
work will be the subject of special notice in the *Journal*.
- Australia—Great Barrier Reef.** *American J. Science* (4) 2 (1896): 240-244. **Agassiz.**
A Visit to the Great Barrier Reef of Australia. By A. Agassiz.
- Australia—Meteorology.** *J. and P.R.S. New South Wales* 29 (1895): 513-551. **Hunt.**
Types of Australian Weather. By Henry A. Hunt. *With Diagrams.*
- Australasian Goldfields.** *Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich* 23 (1896): 398-422. **Schmeltzer.**
Herr Bergant Schmeltzer. Reisebeobachtungen in den Goldländern Australiens.
Herr Schmeltzer, the well-known German mining engineer, who had previously
reported on the goldfields of South Africa, here describes his visit to the mines of
Australia, Tasmania, and New Zealand.
- Central Australia—Horn's Expedition.** **Greifrath.**
Deutsche Rundschau G. 13 (1896): 250-252.
Mr. Horn's Expedition in central Australien. Von Henry Greifrath. *With*
Portrait.
- Fiji.** **Thomson.**
Fiji for Tourists. By Basil Thomson. London: the Canadian-Australian Royal
Mail Steamship Line [not dated]. Size 9 × 6, pp. 48. *Presented by Mr. James*
Huddart.
The facts about Fiji are put together in an interesting way.
- German New Guinea.** *Petersmann M.* 42 (1896): 193-195. **Kunze.**
Krakar oder Dampier-Insel. Von Missionar Georg Kunze. *With Map.*
- German New Guinea.** *Deutsches Kolonialblatt* 7 (1896): 448-453. **Bädiger.**
Deutsch-New-Guinea. Ueber den Verlauf der Ehlerschen Expedition.
An account of the ill-fated Ehlers expedition across New Guinea, given by the
Imperial "Landeshauptmann" Rüdiger.
- Kermadec Islands.** *T. and P. New Zealand I.* 25, 1895 (1896): 47-49. **Smith.**
Volcanic Activity in Sunday Island in 1814. By S. Percy Smith.

New Hebrides—Ambrym Island.**Purey-Cust.**

Report on the Eruption of Ambrym Island, New Hebrides, S. W. Pacific. October and November, 1894. By Commander H. E. Purey-Cust, R.N., H.M.S. *Dart*. Hydrographic Department, Admiralty. London: Printed for Her Majesty's Stationery Office, by Darling and Son. Size 15 x 8½, pp. 26. Map, Chart, and Illustrations. Presented by the Hydrographer, Admiralty.

See *Journal* for December, 1896, vol. viii. p. 563.

POLAR REGIONS.

Antarctic. *Tijds. K. Ned. Aardrijks. Genoots.* Amsterdam (2) 13 (1896): 341-363. **Ruyz.**
Zuhl-Pool onderzoek. Door Dr. J. Mar. Ruyz.

A summary of recent Antarctic voyages and projects.

Antarctic. *T. and P. New Zealand L.* 28, 1895 (1896): 62-71. **Schaw.**

Antarctic Research. By Major-General Schaw.

Refers to recent projects and results.

Antarctic. *P. and T. Queensland Br., R.G.S. Australasia* 11 (1896): 34-38. **Boyd.**

Antarctic Exploration. By Major A. J. Boyd.

A summary of past work.

Antarctic Exploration. *P.R.S. Tasmania, 1894-95* (1896): 42-50. **Mault.**

Antarctic Exploration. By A. Mault.

Antarctic Icebergs. *J. and P.R.S. New South Wales* 29 (1895): 280-315. **Russell.**

Icebergs in the Southern Ocean. By H. C. Russell. With Chart.

Also a separate reprint from the Author.

Antarctic Rocks.**David, Smeech, and Schofield.**

J. and P.R.S. New South Wales 29 (1895): 461-492.

Notes on Antarctic Rocks collected by Mr. C. E. Borchgrevink. By T. W. F.

David, W. F. Smeech, and J. A. Schofield. With Plates.

The first part of this paper is a summary of Antarctic exploration; the second part, the petrology of the rocks collected by Borchgrevink, which include no sedimentary rocks, but numerous specimens of basalt, trachytes, andesites, as well as a granitic rock and a mica schist, the latter being held as evidence of continental origin, and as an indication that the Antarctic land is continental, and not insular.

Arctic.**Volante.**

L. Una. A. Volante. Il più grande avvenimento del secolo ossia la priorità degli Italiani nella definizione Scientifica o Scoperta tecnica del Polo Nord. Torino, 1896. Size 2½ x 6, pp. 12. Presented by the Author.

Arctic—Andrée's Expedition.

A travers le Monde, Tour du Monde (n.s.) 2 (1896): 334-335.

L'Expédition Andrée au Pôle Nord. With Portrait and Illustration.

Arctic—Franz Josef Land. *Nature* 55 (1896): 29.

Copeland.

The Austro-Hungarian Map of Franz Josef Land. By Prof. Ralph Copeland.

Arctic—Nansen Expedition. *National G. Mag.* 7 (1896): 339-344.

Man.

The Nansen Polar Expedition. Special Report of the Hon. Ernest A. Man, United States Consul at Bergen. With Map.

Arctic—Nansen's Expedition. *G. Tidsskrift* 13 (1896): 135-146.

Dr. Fridtjof Nansen's Polar expedition. With Map.

Arctic project.

Rev. Scientifique (1) 6 (1896): 361-365.

Pesco.

Au pôle nord en bateau sous-marin. Par M. G.-L. Pesco.

Arctic Regions—Hall. *Quarterly J.R. Meteorological S.* 22 (1896): 251-267. **Harries.**

Arctic Hall and Thunderstorms. By Henry Harries. With Map.

Mr. Harries has tabulated all records of hail and of thunderstorms in latitudes north of 60° N., with the view of ascertaining the truth of the generally repeated statements that hail does not occur in high latitudes. This he shows to be erroneous.

Arctic work.

Natural Science 9 (1896): 232-239.

Gregory.

The Arctic Work of 1896. By J. W. Gregory, D.Sc.

- Swedish Arctic Expedition.** *Ymer* 16 (1896): 181-192. **André.**
Rapport angående 1896 års svenska polarexpedition. Af S. A. André.

MATHEMATICAL GEOGRAPHY.

- Geodesy.** *C. Rd.* 123 (1896): 457-460. **Lallemand.**
Sur la stabilité des piquets employés comme repères provisoires dans les nivellements de précision. Note de M. Ch. Lallemand.
- Geodesy.** *C. Rd.* 123 (1896): 153-160. **Basset.**
Rapport sur un Mémoire de M. Jäderin, concernant une nouvelle méthode de mesure de base. Par M. Basset.
- Geodesy.** *C. Rd.* 123 (1896): 410-415. **Lallemand.**
Sur la régle des erreurs systématiques dans les nivellements de précision. Note de M. Ch. Lallemand.
- Geodesy—Gravity.** *Riv. G. Italiana* 3 (1896): 241-258, 353-370. **Schiaparelli.**
Sulle anomalie della gravità, Discorso letto alla Società Italiana di Scienze Naturali in Milano il 1° marzo 1896 da G. V. Schiaparelli.
- Geodesy—Latitude and Gravity.**
Veröffentlichung des Königl. Preussischen Geodätischen Institutes, Bestimmung der Polhöhe und der Intensität der Schwerkraft auf zwei-und-zwanzig Stationen von der Ostsee bei Kolberg bis zur Schneekoppe. Berlin: P. Stankiewicz, 1896. Size $10\frac{1}{2} \times 7\frac{1}{4}$, pp. xiv. and 288. *Plates.*
- Geodesy—Refraction.** *C. Rd.* 123 (1896): 222-225. **Lallemand.**
Sur l'erreur de réfraction dans le nivellement géométrique. Note de M. Ch. Lallemand.
- Globes.** **Pomba.**
Sur la construction des Globes. Par Cesare Pomba, Turin. Extrait des Comptes-rendus du Sixième Congrès International de Géographie tenu à Londres en Juillet, 1895. Size $10 \times 6\frac{1}{4}$, pp. 6.
- Historical—The Great-staff.** **Schlick.**
Der Jakobstafel. Von A. Schlick in Hamburg. Sonderabdruck aus dem Jahresbericht der Geographischen Gesellschaft in München 1894-95 [pp. 93-174 in the Jahresbericht]. München, 1896. Size 9×6 , pp. [82]. *Illustrations. Presented by the Author.*
- Latitude and Longitude.** *B.S.G. Lincei* 5 (1895): 271-277. **Guerrero.**
Procedimiento gráfico para determinar la latitud y la meridiana de un lugar. Por A. Guerrero.
- Magnetic Instrument.** **Wild.**
Theodolith für magnetische Landesaufnahmen. Von Heinrich Wild.—Festschrift der Naturforschenden Gesellschaft in Zürich 1746-1896. II. Pp. 149-173. Zürich: Zacher and Furrer, 1896. Size $9\frac{1}{4} \times 6\frac{1}{4}$.
An instrument for determining the magnetic conditions of dip, inclination, and total intensity in the field with great exactness.
- Map Projections.** *G.Z.* 2 (1896): 495-511. **Bludau.**
Über die Projektionen der Erdkarten. Von Dr. Alois Bludau. With *Plates*.
A discussion of the choice of projection for maps of the world suitable for the representation of various distributions.
- Map Projections.** **Zacharias.**
Oversigt K. Danske Vidensk. Selsk. Forhandl. (1896): 135-149.
Notits om geografiske Kærtprojektioner. Af Generalmajor Zacharias.
- Map Projections.** *M. u. n. R. Militär-G.* I 15, 1895 (1896): 203-218. **Hartl.**
Studien über Wächentrone Kugelprojektionen. Von Heinrich Hartl. With *Maps*.
- Mirage.** *Naturw. Wochenschrift* 11 (1896): 269-274. **Nölke.**
Zur Theorie der Luftspiegelungen. Von Fr. Nölke.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Aurora.

Rev. Scientifique (4) 4 (1895): 557-561; (4) 5 (1896): 558-563; (4) 6 (1896): 103-112, 173-170.

Durand-Gréville.

Les aurores boréales, d'après des publications récentes. Par M. Durand-Gréville. *With Map and Illustrations.*

Beach Formation.

P.I. Civil Engineers 125 (1896): 2-37.

Wheler.

Littoral Drift: in its relation to the Outfalls of Rivers, and to the Construction and Maintenance of Harbours on Sandy Coasts. By W. H. Wheeler. *With Plate and Illustrations.*

This will be referred to in the Monthly Record.

Earthquakes.

Volante.

A. Volante. La luce nel terremoto. Lezioni sperimentale e rassicurante dettata dalla natura stessa. Torino: Sig. Ronx Frassati & Co, 1895. Size 10 x 6½, pp. 18. *Presented by the Author.*

Land Forms.

J. Geology 4 (1896): 567-581, 657-678.

Campbell.

Draught Modifications and their Interpretation. By Marius R. Campbell.

Meteorology.

Black.

Ocean Rainfall with Chart and Tables. By W. G. Black, 1861-1875. Size 10 x 6½, pp. 12. *Presented by the Author.*

Meteorology.

Abh. Math.-Phys. Classe A. W. München 18 (1895): 591-650. Gewitterstudien auf Grund von Ballonfahrten. Von Leonhard Sohncke. Describing observations made in balloons on thunderstorms.

Sohncke.

Meteorology.

Ann. Hydrographie 24 (1896): 367-375.

Köppen.

Die gegenwärtige Lage und die neueren Fortschritte der Klimatologie. Von Prof. Dr. W. Köppen.

Meteorology and Oceanography.

Petterson.

Meteorol. Z. 13 (1896): 285-321. Ueber die Beziehungen zwischen hydrographischen und meteorologischen Phänomenen. Von Otto Petterson.

A separate copy of this paper has been presented by the Author.

Meteorology—Detonations.

Rev. Scientifique (4) 6 (1896): 461-467.

Broeck.

Les Mistpoesters. Detonations mystérieuses de la mer du Nord et des contrées environnantes. Par M. Ernest van den Broeck.

An account of curious atmospheric detonations frequently heard in the North Sea, and a request that any particulars of the phenomenon being heard should be sent to the author, M. Ernest van den Broeck, 39, Place de l'Industrie, Brussels, who is proceeding with the investigation of the subject.

Meteorology—Föhn.

Sitzb. A. W. Wien 104, Abth. II, a (1895): 427-461.

Ferner.

Ueber die Häufigkeit die Dauer und die meteorologischen Eigenschaften des Föhns in Innsbruck. Von J. M. Ferner.

Meteorology—Trade Winds.

Hadley.

Memoranda von Schriften und Karten über Meteorologie und Erdmagnetismus herausgegeben von Professor Dr. G. Hellmann. No. 6. George Hadley, Concerning the Cause of the General Trade-Winds. London, 1733. Berlin: A. Asher & Co, 1896. Size 10 x 8½, pp. [22].

Facsimile reproduction of Hadley's paper on the Trade winds with German notes.

Meteorology—Tropical Rain.

Wiener.

Sitzb. A. W. Wien 104, Abth. I. (1895): 1397-1431.

Beiträge zur Kenntnis des tropischen Regens. Von J. Wiener.

Studies of rainfall at Buitenzorg, in Java.

Oceanography.

Ann. G. S. (1896): 363-367.

Thoulet.

Observations océanographiques faites pendant la campagne du *Caudan*, dans le golfe de Gascogne en août 1895. Par M. J. Thoulet. *With Map and Diagram.*

Oceanography—Baltic Sea.

Aurivillius.

Bihang. Svensk. Vetenskaps-A. Handlingar 21 (1896): 84.

Das Plankton des Baltischen Meeres. Von Carl W. S. Aurivillius. *With Map and Plate.*

Oceanography—Historical.**Hamilton.***T. and P. New Zealand* 1, 28, 1895 (1896): 163-178.

On the Rise and Progress of our Knowledge of the Oceanic Area. By A. Hamilton.

Physical Geography.**Haun.**

Haun, Höchstetter, Pokorny. Allgemeine Erdkunde. Fünfte, neu-bearbeitete Auflage. Von J. Haun, Ed. Brückner, und A. Kirchhoff. I. Abtheilung: Die Erde als Ganzes, ihre Atmosphäre und Hydrosphäre. Von Dr. J. Haun. Prag and Wien: F. Tempky; Leipzig: G. Freytag, 1896. Size 11½ x 8, pp. 336. Maps and Illustrations. Presented by the Publisher.

This will be specially noticed.

Soil-formation.**Wollny.**

Die Zersetzung der organischen Stoffe und die Humusbildungen, Mit Rücksicht auf die Boden-Cultur. Von Dr. Ewald Wollny. Heidelberg: Carl Winter's Universitätsbuchhandlung, 1897 [1896]. Size 10 x 7, pp. x. and 480. Presented by the Author.

This is a profound study of the agencies at work in the formation of humus or vegetable mould, taking account of the chemical changes of oxidation and nitrification, and the part played in them by micro-organisms, also of the other functions performed by micro-organisms in soils, the influence of plants, and of animals such as the earth-worm. A study of the physical characters of soil follows, and the conclusion is a practical application of principles to the problem of artificially improving poor soils.

Speleology.**Martel.**

Speleology. By E. A. Martel. Reprinted from the 'Report of the Sixth International Geographical Congress, held in London, 1895.' Size 10 x 6½, pp. 6.

Terrestrial Magnetism. *Atti R. A. Lincei* (5) *Rendiconti* 5 (1896): 66-74. **Folgerhatter.**

Variazioni secolari dell'inclinazione magnetica. Nota del Dott. G. Folgerhatter.

Terrestrial Magnetism.**Halley, Whiston, Willeke, Humboldt, Hansteen.**

Neudrucke von Schriften und Karten über Meteorologie und Erdmagnetismus herausgegeben von Professor Dr. G. Hellmann. No. 4. E. Halley, W. Whiston, J. C. Willeke, A. von Humboldt, C. Hansteen. Die ältesten Karten der Isogonen Isoklinen Isodynamen 1701, 1721, 1768, 1804, 1825, 1826. Berlin: A. Asher & Co., 1895. Size 10 x 8, pp. 26. Maps.

A valuable series of facsimile reproductions of the earliest maps showing the conditions of terrestrial magnetism, carefully annotated.

Terrestrial Magnetism.**Schmidt.***Abh. Math.-Phys. Classe A. W. München* 19 (1896): 1-65.

Mittelnogen über eine neue Berechnung des ordmagnetischen Potentials. Von Adolf Schmidt in Gotha.

Underground Water.**Jack.**

The Submarine Leakage of Artesian Water. By Robert L. Jack, Government Geologist of Queensland. [Read before the Royal Society of Queensland, July 11, 1896.] Size 9 x 6, pp. 14. Presented by the Author.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.**Anthropology.***Ann. G.* 5 (1896): 407-424.**Lapicque.**

La race négroïde et sa distribution géographique. Par M. Louis Lapicque. 1700 Plats.

Anthropological Journal.

The Australasian Anthropological Journal. The Official Organ of the Anthropological Society of Australasia. Edited by Dr. Carroll. No. 1. Ashfield, Sydney, N.S.W.: G. Watson, 1895. Size 11 x 9, pp. 24. Price 1s.

It is a satisfactory sign of the interest taken in the remaining primitive people of the Pacific that an Australian Anthropological Journal has been started; its progress will be watched with interest.

Commercial Geography. *J.R. Colonial* 1, 27 (1896): 333-335.**Clayden.**

Our Colonial Food Supplies. By Arthur Clayden [Abstract.]

No. I.—JANUARY, 1897.]

Early Syrian Maps. *J. Asiatique* (9) 8 (1896): 155-163. Nan.
 Notice sur quelques cartes syriaques. Par M. F. Nan.

The map which is here figured is one of the constellations, but brief descriptions are also given of two maps of parts of the Earth which were found roughly drawn on an old Syrian manuscript.

Geography. Ripley.

Geography as a sociological Study. By William Ripley. From *Political Science Quarterly*, vol. x. No. 4 [April, 1896]. Size 9½ x 6, pp. [20].

Mr. Ripley has gone deeply into the literature of his subject, and he specially refers to the part played by the Royal Geographical Society in promoting the modern view of the place of geography amongst the sciences.

Historical. Müller.

Asien und Europa nach altägyptischen Denkmälern. Von W. Max Müller. Mit einem Vorwort von Georg Ebers. Leipzig: W. Engelmann, 1893. Size 9½ x 6½, pp. xii. and 404. Map and Illustrations.

Historical—Cassini. *B.S.G. Italiana* (3) 9 (1896): 253-256. Blesich.
 I lavori geografici di C. F. Cassini di Thury, di Aldo Blesich.

Historical—Diogo Cão. *B.S.G. Lisboa* 14 (1895): 881-891. Cordeiro.
 Vespas do Centenario. O ultimo padrao de Diogo Cão. Por Luciano Cordeiro.

Historical—D'Entrecasteaux. *B.S.G. Paris* (7) 17 (1896): 127-144. Hamy.
 Notice sur une collection de dessins provenant de l'expédition de d'Entrecasteaux. Par E.-T. Hamy.

Historical Maps. Steger.

Untersuchungen über italienische Seekarten des Mittelalters auf Grund der Kartometrischen Methode. Inaugural-Dissertation zur Erlangung der Doktorwürde der hohen philosophischen Fakultät der Georg-Augusts-Universität zu Göttingen, vorgelegt von Ernst Steger. Göttingen, 1896. Size 10 x 7, pp. 51. Maps. Presented by Prof. Dr. Hermann Wagner.

Historical Maps. Wagner.
 The Origin of the Medieval Italian Nautical Charts. By Professor Dr. Hermann Wagner. Reprinted from the Report of the Sixth International Geographical Congress, held in London, 1895 (Congress Report, pp. 695-702). Size 10 x 6½, pp. 8.

BIOGRAPHY.

Abbott. *Academy* (1896): 283-284.

Sir James Abbott, K.C.B. By J. S. C.

A record of the life of "the last survivor of that band of Anglo-Indian 'politicals,' whose adventurous travels redeem the tragedy of the first Afghan war."

Bastian. *Globus* 70 (1896): 1-4.

Zum siebenzigsten Geburtstage Adolf Bastians. With Portrait.

Contains references to the work of this distinguished ethnologist.

Boyrich. *Deutsche Rundschau* (1) 19 (1896): 40-42.

Professor Ernst Boyrich. With Portrait.

Biographical Dictionary.

Lee.

Dictionary of National Biography. Edited by Sidney Lee. Vol. xlvii. Puckle-Reidford. Vol. xlviii. Reilly—Robins. London: Smith, Elder & Co., 1896. Size 10 x 7, pp. (vol. xlvii.) vi. and 450; (vol. xlviii.) vi. and 441. Price each vol., 15s.

Vol. xlvii. includes notices of the following names of geographical interest: William John Samuel Pullen, by Prof. J. K. Laughton; Samuel Purchas, by the same; John Purdy, by A. F. Pollard; John Rae, by Herbert Rix; Sir Thomas Stamford Raffles, by J. A. Hamilton; Sir Walter Raleigh, by Prof. J. K. Laughton and Sidney Lee; Sir Andrew Crombie Ramsay, by the Rev. Prof. Bonney; Henry Raper, by Prof. J. K. Laughton; Sir Henry Creswicke Rawlinson, by Stanley Lane-Poole; and William Winwood Reade, by Thompson Cooper. Vol. xlviii. James Rennell, by Sir Clements Markham, K.C.B.; Claudius James Rich, by Stanley Lane-Poole; James Richardson, by C. R. Beazley; John Richardson, by G. S. Boulger; and Joseph Ritchie, by Richard Garnett.

- Butler.** *T. Canadian I.* 4 (1895): 284-298. **Cruikshank.**
 Memoir of Captain Walter Butler. By Captain Ernest Cruikshank.
- Deken.** *Deutsche Rundschau G.* 18 (1896): 370-371. ———
 R. P. de Dekon. *With Portrait.*
- Dieterici.** *Deutsche Rundschau G.* 18 (1896): 563-570. **Missler.**
 Dr. Friedrich Dieterici. Von Adolf Missler. *With Portrait.*
- Ehlers.** *M. G. Ges. Wien* 39 (1896): 208-211. ———
 Otto Ehlers.
- Holden.** *Deutsche Rundschau G.* 18 (1896): 421-422. ———
 Edward S. Holden. *With Portrait.*
 Biographical notes of Mr. E. S. Holden, director of the Lick Observatory, California.
- Lehnert.** *Deutsche Rundschau G.* 18 (1896): 422-424. ———
 Josef Ritter v. Lehnert. *With Portrait.*
- Leuzinger.** *Jahrb. Schweizer Alpenclub* 31 (1895-96) (1896): 296-303. **Held.**
 Kartograph Rudolf Leuzinger. Von L. Held. *With Portraits and Illustration.*
- Nansen.** *Brögger and Rølsen.*
 Fridtjof Nansen, 1861-1893. By W. C. Brögger and Nordahl Rølsen. Translated by William Archer. London: Longmans & Co., 1896. Size 9½ x 6½, pp. x. and 402. *Portraits, Maps, and Illustrations. Price 12s. 6d. Presented by the Publishers.*
- Núñez.** *Nineteenth Century* (1896): 105-116. **Graham.**
 Alvar Núñez. By R. B. Cunningham Graham.
- Prestwich.** *Natural Science* 9 (1896): 89-98. **Woodward.**
 Joseph Prestwich. By H. B. Woodward.
- Rae.** *P.R.S.* 60 (1896): v.-vii. ———
 Dr. John Rae, M.D.
- Rohlf.** *Globus* 70 (1896): 31-33. **Wolkenhauer.**
 Gerhard Rohlf. Von Dr. W. Wolkenhauer. Bremen.
- Rohlf.** *G. Nachrichten (Aus allen Weltteilen)* (1896): 129-130. ———
 Gerhard Rohlf.
- Rüttemeyer.** *Jahrb. Schweizer Alpenclub* 31 (1895-96) (1896): 285-295. **Schmidt.**
 Ludwig Rüttemeyer als Gebirgsforscher. Von Dr. Carl Schmidt.
- Rüttemeyer.** *Deutsche Rundschau G.* 18 (1896): 378-379. ———
 Ludwig Rüttemeyer. *With Portrait.*
- Ryder.** *Deutsche Rundschau G.* 19 (1896): 37-40. **Missler.**
 Karl Ryder. Ein dänischer Grönlandforscher. Von Adolf Missler. *With Portrait.*
- Schiaparelli.** *Deutsche Rundschau G.* 18 (1896): 463-471. ———
 Giovanni Schiaparelli. *With Portrait.*
- Sclater.** *Science (n.s.)* 4 (1896): 293-298. **Goode.**
 Philip Lutley Sclater. By G. Brown Goode.
- Siebold.** *Deutsche Rundschau G.* 18 (1896): 373-378. **Wolkenhauer.**
 Philipp Franz von Siebold. Ein Gedenkblatt zu seinem hundertjährigen Geburtstag von W. Wolkenhauer. *With Portrait.*
- Stoach.** *Ann. Hydrographia* 24 (1896): 241-243. ———
 Albrecht von Stoach, als Organisator der wissenschaftlichen Arbeit in der Krieges- und Handelsmarine des Reiches.
- Tromholt.** *Deutsche Rundschau G.* 18 (1896): 471-474. **Missler.**
 Sophus Tromholt. Von Adolf Missler. *With Portrait.*

GENERAL.

- Balloonng.** *Aus Allen Weltteilen* 27 (1896): 337-348, 381-390. **Raschin.**
 Die Bedeutung wissenschaftlicher Ballonfahrten für die geographische Forschung und das Andreäische Polarprojekt. Von Otto Raschin. *With Illustrations.*

Bibliography of Geography.

Baschin.

Bibliotheca Geographica, herausgegeben von der Gesellschaft für Erdkunde zu Berlin. Bearbeitet von Otto Baschin. — Band II. Jahrgang 1893. Berlin: H.W. Kuhl, 1896. Size 9½ x 6, pp. xvi. and 384. Presented by the Gesellschaft für Erdkunde, Berlin.

This is specially referred to in the Monthly Record.

Bibliography of Geography.

Bibliographie de l'Année, 1895. I. Partie générale. II. Partie régionale. Avec un Index alphabétique des Auteurs analysés et cités. — *Annales de Géographie*. No. 23 — 5^e Année, 15 Septembre, 1896. Paris: A. Colin & Cie. Size 10 x 6½, pp. 288.

The excellence of this critical bibliography has frequently been referred to.

Early Danish Travels. *Aarb. Nordisk Oldk. Historie (II)* II (1896): 79-96. **Eskund.**
Kan Historie af prætoriske Densorum in terram sanctam regnes til Danmarks Litteratur? Af Kr. Kildund.**Educational—Methods.**

Burrows.

On some methods of teaching Geography. By the Rev. F. R. Burrows. Reprinted from the *Parents' Review*. London: G. Philip & Son, [1896]. Size 8½ x 5½, pp. 20. Price 6d. Presented by the Author.

Educational—Text-book.

Lyde.

Man and his Markets. A Course in Geography. By Lionel W. Lyde. London: Macmillan & Co., 1896. Size 7 x 5, pp. xii. and 186. Illustrations. Price 2s. Presented by the Publishers.

A simply worded outline of some of the main facts of commercial geography, profusely illustrated.

Educational—Text-book.

Reusch.

Kortfattet Geographi. Af Dr. Hans Reusch. Syvende Udgave. Kristiania, T. O. Brøgger, 1896. Size 9 x 6½, pp. 64. Maps and Illustrations. Presented by the Author.

An excellent model of an elementary geography book in Norwegian on the text-atlas plan.

Educational—Text-books.

Gambino.

Giuseppe Gambino, Dal Luogo Natio alla sfera Celeste. Testo-Atlante di Geografia per le scuole elementari. Vol. I, per la 3^a Classe (1895, pp. 64); vol. II, per la 4^a Classe (1895, pp. 80); vol. III, per la 5^a Classe (1895, pp. 84). Palermo: Benio Sandron. Size 10 x 7½. Maps and Illustrations. Presented by the Author.

These class-books are well illustrated and carefully planned. The strong geographical instinct of the Italians finds expression in the great attention given to map-drawing, the basis of exact geographical teaching.

French Geographical Congress. *B.S.G. Commerce, Bordeaux*, 19 (1896): 465-468. —

Vuex du Congrès géographique de Lorient.

Geographical Exhibition.

XI^{me} Congrès des Sociétés Suisses de Géographie à l'occasion de l'Exposition Nationale Suisse à Genève. Du 24 au 27 Mai, 1896. *Le Globe*. Tome XXV. Numéro spécial. Genève: R. Burkhardt, 1896. Size 10 x 6½, pp. 96.

Geographical Terms. *National G. Mag.* 7 (1896): 201-202.

Hill.

Descriptive topographic terms of Spanish America. By Robert T. Hill. This will be specially referred to.

Geography.

B.S. Languedoc G. 19 (1896): 5-24.

Rouville.

Quelques mots de Géographie rationnelle. Par M. Paul de Rouville.

Geography as a Science. *Rev. G. Italiana* 3 (1896): 185-199, 253-281.

Porena

La Geografia qual'è oggi in se stessa e nei suoi contatti con altre scienze fisiche e sociali. Prelusione al corso di Geografia nella R. Università di Napoli letta dal prof. Filippo Porena.

Mountaineering. *Jahresh. G. Ges. München*, 1894 u. 1895 (1896): 51-67.

Günther.

Wissenschaftliche Bergbesteigungen in älterer Zeit. Von Siegmund Günther.

Travel.

Pennell.

Tantallon Castle: the Story of the Castle and of the Ship, told by Elizabeth Robins Pennell, with Illustrations by W. L. Wyllie; W. Hatherall, Joseph Pennell, A. S. Hartwick, and D. R. Niven. Edinburgh: T. and A. Constable, 1895. Size 11½ x 9, pp. viii. and 38. Presented by Messrs. Donald Currie & Co.

An account of the Castle Line steamer *Tantallon Castle*, and of the castle from which her name is taken, with remarks on South Africa.

Travel—Banks' Journal.

Hecker.

Journal of the Right Hon. Sir Joseph Banks, Bart., &c., &c., during Captain Cook's First Voyage in H.M.S. *Endeavour* in 1768-71, to Terra del Fuego, Otaheite, New Zealand, Australia, the Dutch East Indies, &c. Edited by Sir Joseph D. Hooker. London: Macmillan & Co., 1896. Size 2½ x 6, pp. lii. and 496. *Portraits and Charts. Price 17s. Presented by the Editor.*

This will be specially noticed.

Travels—Egypt and India.

Ookhtomsky.

Travels in the East of Nicholas II., Emperor of Russia, when Cossarwitch, 1890-1891. Written by order of His Imperial Majesty by Prince E. Ookhtomsky, and Translated from the Russian by Robert Goodlet (St. Petersburg). In two volumes. Edited by Sir George Birdwood. Vol. I. London: A. Constable & Co., 1896. Size 16 x 12, pp. viii. and 374. *Illustrations. Price 22 12s. 6d. Presented by the Publishers.*

This superb volume is produced in a manner worthy of the distinguished party whose travels it records. It is imperial in size and in literary style, while the illustrations are for the most part engravings of the highest finish, the direct reproductions of photographs being confined to the finest collotypes or photogravures. The first volume records the tour of the present Tsar through Egypt and India, giving descriptions of the places visited and the magnificent receptions accorded by the various government officials and native princes.

Wind and Flight. *Sitzb. A. W. Wien 104, Abth. II, 6 (1895): 263-275. Obermayer.*

Ueber die Wirkung des Windes auf schwach gewölbte Flächen. Von A. v. Obermayer.

On the action of wind on the sails of flying-machines.

NEW MAPS.

By J. Coles, Map Curator, R.G.S.

EUROPE.

Austria.

Hydrographischer Dienst.

Beiträge zur Hydrographie Österreichs. Herausgegeben vom k. k. hydrographischen Central-Bureau. 4. Heft. Uebersichtskarte der hydrographischen Expansion Österreichischen Flussgebiete. Scale 1:750,000 or 11·8 stat. miles to an inch. Wien, 1896. *Presented by the K. k. Österreichisches Centralbureau für den hydrographischen Dienst.*

This hydrographical map of the Austrian Empire is a reduction of the large map published by the Military Geographical Institute in Vienna. It shows all the river-basins, the area of which exceed 500 square kilometres. All stations where the rain and snowfall are measured are indicated, as well as places where gauges are used for measuring the depth of water. The map is accompanied by letterpress containing an index, alphabetically arranged, and tables giving the areas of the river-basins. The map has evidently been most carefully compiled.

Austrian Lakes.

Penck and Richter.

Atlas der Österreichischen Alpenseen, mit Unterstützung des Hohen k. k. Ministeriums für Cultus und Unterricht. Herausgegeben von Dr. Albrecht Penck und Dr. Eduard Richter. II. Lieferung: Seen von Kärnten, Krain und Südtirol. 10 Karten und 32 Profile auf 9 Tafeln, hauptsächlich nach eigenen Lothungen entworfen von Prof. Dr. Eduard Richter. Wien: Ed. Holzels geographisches Institut. 1895. *Presented by Dr. Eduard Richter.*

This is the second issue of this valuable atlas. It contains 10 maps and 32 profiles of the lakes of Carinthia, Carniola, and South Tirol, on nine sheets. The depths of the lakes, the elevations of the surrounding country, and the beds of the lakes, are represented by contours, in addition to which the lakes are bathymetrically coloured.

England and Wales

Ordnance Survey.

Publications issued since November 8, 1886.

1-inch—General Maps:—

ENGLAND AND WALES:—87, 257, 288, engraved in outline; 221, 224, 237, 238, 269, hills engraved in black or brown, 1s. each, revised.

6-inch—County Maps:—

ENGLAND AND WALES:—Cornwall (revision), 46 N.W. Devonshire (revision), 123 N.E., 130 S.W. Hampshire, 8 S.W., 8 E., 9 N.W., S.W., 8 E. Lancashire (revision), 109 N.E., 116 N.W., 117 N.E., 118 S.E., showing Manchester Ship Canal, 1s. each. Surrey (revision), 18 N.E., 1s. each.

25-inch—Parish Maps:—

ENGLAND AND WALES:—Durham (revision), XVI. 8, 12; XVII. 13; XXI. 1, 2, 8, 9; XXIII. 2; XXVI. 4, 3s. each. Essex (revision), LX. 8, 14, 16; LXI. 9, 11, 13, 15; LXVII. 2, 3s. each. Hampshire (revision), XII. 8, 12; XX. 4; XXXVI. 9, 10, 11, 13, 14, 15; XXXVIII. 16; XL. 13; LXI. 14, 15, 16; XLII. 13; XLIII. 9, 10, 11, 13, 14, 15; XLVIII. 8, 9; XLIX. 1, 2, 4, 6, 9, 10, 11; L. 7, 11, 15; LI. 3, 6, 8; LII. 2, 10; LVIII. 2, 3, 5, 3s. each. Kent (revision), XVIII. 2, 9, 10, 13, 14; XXIX. 15; XL. 4, 7, 8, 15; LIX. 7, 8; L. 5, 3s. each. Middlesex (revision), XI. 14, 15; XVI. 2; XX. 10, 14; XXV. 2, 3s. each. Surrey (revision), VI. 13; XII. 1; XXIII. 9; XXVI. 11, 13, 15; XXVII. 3, 13, 14; XXVIII. 5, 9; XL. 2, 3s. each. Northumberland (revision), LXXV. 12; LXXVI. 2, 9, 10, 11; LXXXIII. 4, 5, 6; LXXXIV. 2, 4; LXXXV. 2, 3, 4, 5, 6, 8, 9, 10, 11, 12; XCI. 6; XCII. 3, 12; CII. 2, 7, 11; CVL. 5, 13; CVIII. 6, 7, 3s. each.

(R. Stanford, Agent.)

Europe.

Peole.

Historical Atlas of Modern Europe from the Decline of the Roman Empire. Comprising also maps of parts of Asia and of the New World connected with European History. Edited by Reginald Lane Poole, M.A., M.D., Lecturer in Diplomatic in the University of Oxford. Part II. Oxford: The Clarendon Press; London, Edinburgh, and Glasgow: Henry Frowde; Edinburgh: W. & A. K. Johnston. 1886. Presented by the Clarendon Press.

Part II. of this atlas contains the following maps: No. XIX. Anglia Sacra, showing the ecclesiastical divisions in the reign of Edward I., with explanatory letterpress, by C. Oman, M.A. No. XXIX. Ireland (Eire) in the twelfth century prior to the Anglo-Norman occupation, and Hibernia (Ireland) after the Anglo-Norman occupation, with explanatory letterpress, by Goldard H. Orpen, M.A. No. LVIII. France under the Ancient Régime, 1600-1790, with explanatory letterpress, by Walter E. Rhodes, M.A.

Europe.

Guido Cora.

Europa a base fisica, costrutta e disegnata dal Prof. Guido Cora. Ditta G. B. Paravia e Comp. Torino. Scale 1: 3,500,000 or 53.2 stat. miles to an inch. 6 sheets. Presented by the Publishers.

This is a physical wall-map of Europe suited to the use of schools. It is drawn in a bold style and orographically coloured. At the foot of the map, given as insets, are small-scale political and ethnographical maps, together with a section of the continent of Europe showing the elevations and depressions, with regard to sea-level, along the forty-sixth parallel of latitude.

Sweden.

Swedish General Staff.

Generalstabens karta öfver Sverige. Scale 1: 100,000 or 1.6 stat. miles to an inch. Sheets 69, Tecknarm; 73, Långebäck.—Karta öfver Norrbottens Län. Scale 1: 200,000 or 3.2 stat. miles to an inch. Sheets 33, Sorsele; 42, Malå. Generalstabens topografiska afdelning. Stockholm. Presented by the Topographical Section of the Swedish General Staff.

AFRICA.

Africa.

Service Géographique de l'Armée.

Carte de l'Afrique. Scale 1: 2,000,000 or 31.5 stat. miles to an inch. Sheet No. 10, Bir el Ahaz. Publié par le Service Géographique de l'Armée en 1889. Paris. Edition de 1896. Price 1 fr.

Algeria.

Service Géographique de l'Armée, Paris.

Carte topographique de l'Algérie. Scale 1: 50,000 or 1.26 inch to a stat. mile. Service Géographique de l'Armée, Paris. Nos. 2, Cap Bougaroun: 33, Gonraya: 39, Cherchel: 49, Tamazgulta: 70, Takitount: 105, Charon: 106, Orléansville: 110, Berronaghia: 184, Aïna Fares: 213, Palikao: 220, Pont de l'Isser. Price 1 fr. 50 c. each sheet.

Rhodesia.

Stanford.

A Map of Rhodesia divided into Provinces and Districts, under the Administration of the British South Africa Co., 1896. Scale 1: 1,000,000 or 15.8 stat. miles to an inch. London: E. Stanford. 5 sheets. Price £1 4s.

This is a new edition of Stanford's Map of Rhodesia. It is divided into provinces and districts, and contains numerous notes describing the nature of the country, positions of ancient ruins, where water is to be found, and other items of information that will be useful to travellers. Gold reefs and mines are indicated, the altitudes are given above sea-level, and all means of communication are laid down. The map contains much new work, and has been carefully revised.

AMERICA.**Peru.**

Rainmond.

Mapa del Perú. Scale 1: 500,000 or 7.0 stat. miles to an inch. A. Rainmond. Sheets 21 and 25. Grabado y Imp. por Erhard F^{co}, Paris. Presented by the Lima Geographical Society.

These two sheets include that portion of South-Central Peru extending from lat 16° 38' S. to 15° 8' S., and from long. 73° 5' W. to 76° 3' W. The hillshading is in brown and is very effective, the water is in blue, and the forests in green. The importance of the towns is indicated by the symbols employed; all roads are laid down; the elevations above sea-level, where known, are given in metres; and at the foot of each sheet an explanation is given of the numerous symbols employed in the map.

CHARTS.**Admiralty Charts.**

Hydrographic Department, Admiralty.

No.	Inches.	
420 m = 1.3		Norway, south-west coast:—The Naar to Lyster, including the approaches to Farsund. 1s. 6d.
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1206 m = 1.3		Japan inland sea:—Yanagi no Seto to Neko Seto. 1s. 6d.
1009 m = 1.5		Japan:—Ouchit sima to Funoko sima. 2s. 6d.
1870 m = 1.0		Tenerife:—Plan added, Puerto de Orozova.
438 m = 4.5		Plans and anchorages in Jamaica:—Plan added, Rio Bueno harbour.
2354 m = 7.2		Approaches to Vera Cruz:—Plan added, port of Vera Cruz.
2346 m = 2.8		Plans on the coast of Chile:—Plan added, Piscochorre and Lobos cotes.

(J. D. Potter, agent.)

Charts Cancelled.

No.	Cancelled by	No.
883 Plan of approaches to anchorages between the Naar and Farsund on this sheet.	New Chart. The Naar to Lyster, including the approaches to Farsund	420

327 Georgian bay.	New Chart.	
2240 San Domingo harbour.	Georgian bay.	327
461 Navassa island.		
463 Cayemites and Baradaires bays.		
473 Jaemel harbour.	New Chart.	
474 Aquin bay.	Harbours and anchorages on the coast	
481 Port au Prince.	of Haiti or San Domingo	472
465 St. Mark bay.		
468 Acul bay.		
472 Port Plata.		
470 Port Dauphin bay.		
467 St. Nicholas mole.		
523 Plan. port of Vera Cruz	New Plan.	
on this sheet.	Port of Vera Cruz on sheet	2854
911 Plan of upper part of	New Chart.	
Amboina bay on this sheet.	Amboina bay	2611
128 Eastern slip on this sheet.	New Chart.	
	Ozuchi sima to Funoko sima	1969

Charts that have received Important Corrections.

No. 2793, England, south coast:—Cowes harbour. 2810, Ireland, east coast:—Lough Carlingford entrance. 1875, North sea:—Elbe, Weser, and Jade rivers. 2246, Baltic sea:—Port Baltic to Hogland. 883, Ports and anchorages on the south coast of Norway. 360, Bermuda islands. 807, Bermuda islands:—From the Narrows to Hamilton. 2916, Newfoundland:—La Poile bay. 331, North America, east coast:—Warsaw, Ossabaw, St. Catherine's, and Sapelo sounds. 1714, Haiti, or San Domingo:—Cape Haiti harbour. 323, Gulf of Mexico:—Port of Vera Cruz and anchorage of Anton Lizardo. 1948, Red sea:—Mersa Makdah and approaches to Trinkital. 1169, Cochin China:—Approaches to Port Courbet. 127, Japan:—Hirado-do-Seto to Simonozeaki strait. 128, Japan:—Channels between Bingo Nada and Harima Nada. 1460, Ports in Arafura sea. 440, Fiji islands, northern portion. (J. D. Potter, agent.)

Pilot Charts.

U.S. Hydrographic Office.

Pilot Chart of the North Atlantic and North Pacific Oceans for November, 1896. Published at the Hydrographic Office, Washington, D.C. Charles D. Sigbee, Commander U.S. Navy, Hydrographer. Presented by the U.S. Hydrographic Office.

PHOTOGRAPHS.

California.

Stiffler and Gill.

Six Photographs of the Sierra Madre of California, taken by Stiffler and Gill. Los Angeles, California. Presented by the Director of the Royal Gardens, Kew.

These photographs have been chosen to show the physical features of the country.

Færoe Islands.

Grossmann and Cahnheim.

182 Photographs of the Færoe Islands (17 plates), taken in 1892, 1894, and 1895, by Dr. Karl Grossmann and Otto Cahnheim. Presented by Dr. Karl Grossmann.

These photographs convey an excellent idea of the wild scenery of the Færoe Islands. The groups of people, photographs of their dwellings, and scenes in the fishing villages, show something of their habits of life and the principal industry, fish-curing. In addition to this, many of the photographs are of considerable value as illustrating the geological structure of the different islands, and have evidently been taken with that object in view.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



Based on Ringier's Map with additions from the surveys of
MESSRS. W.B. PATON AND J.L. MYRES.
Scale 1:250,000 (39.476 in.)

[illegible]



SKETCH MAP
of
WESTERN AUSTRALIA
(CENTRAL PART),
By W. CARR BOYD.
1895.

Scale of Miles
10 20 30
Natural Scale 1:2,000,000 or 1 inch = 31.50 Miles.
In search indicated limit of permanent water.
Route ———









The Geographical Journal.

No. 2.

FEBRUARY, 1897.

VOL. IX.

A JOURNEY IN THE MAROTSE AND MASHIKOLUMBWE COUNTRIES.*

By Captain ALFRED ST. HILL GIBBONS, 3rd East Yorkshire Regt.

THE object of my journey was to remove, so far as possible, the blank on the map of Africa bounded on the south and west by the Zambezi, and on the east by the Kafukwe river. I was accompanied by Mr. Perry C. Reid and Captain Alfred Bertrand from Palapye to the Zambezi. We there took different routes, and I shall confine myself to giving some account of the results of my own journey, leaving my companions each to tell his own tale.

I left Kazungula, a small native reed-built town of about one thousand inhabitants, on the Zambezi river, on July 2, 1895, *en route* for Lilalui, the headquarters of Liwanika, the paramount chief of the Marotse, Mabunda, Matutela, Mankoya, Masubia, Matoka, Makwenga, and a certain section of the Mashikolumbwe.

Latia, the king's son, who governs the eastern part of this empire in his father's name, had supplied me with canoes which were to convey me to Seshoke, where fresh ones would be placed at my disposal.

Opposite Kazungula—called after some half-dozen large shady trees of that name in and near the town—the river is about 458 yards wide and 40 feet deep in the channel in July, while eight months later, towards the end of the rainy season, the water-level is about 20 feet higher and the river some 100 yards wider. My boiling-point thermometer made the river-bank 3210 feet above the sea-level.

A short distance above this point is the confluence of the so-called Chobe river with the Zambezi. From its source for some 200 miles

* This and the two following papers were read at the Royal Geographical Society, January 3, 1897. Map, p. 248.

this river is known as "Kuando." The future must decide whether the upper or lower section is to give its name to the whole. "Chobe," as applied to the lower river, known throughout the country as "Linyanti," is undoubtedly a misnomer, the explanation of which seems to me to be obvious. Though a chief (or a succession of chiefs) called Linyanti originally gave the river that name, he has been dead many years, yet the name has survived him. Chobe, on the other hand, was a name known for a few years among a passing tribe of strangers. It is, I think, advisable—and more so in the interests of travelling than home geographers—that rivers and places should retain their native names so far as possible. I therefore submit that either Linyanti or Kuando should be substituted for Chobe as the name of this river.

To return to my journey. I had passed the Mambova rapids the day I left Kazungula. For about 90 miles above them the course of the river is unbroken, not picturesque, and reed-bound. In the dry season treeless islands form a rendezvous for countless flocks of waterfowl. On the right bank the affluents are few and unimportant, while on the left the big river is fed by many tributaries, some of which drain considerable tracts of country. Among these is the Ungwezi, of which the Intengwi is a wet-season overflow, and not an independent tributary, as has hitherto been supposed; the Kasain, which receives the waters of the Machili in the rainy season, about a mile above its confluence with the Zambezi; and the less important Inanja—a river about 70 miles long, which enters the big river a few miles to the west of the Kasain. On the third day I shot two hippos, one of abnormal size. From root of tail to snout his length was 14 feet $\frac{1}{4}$ inch, while the circumference of his head, taken midway between eyes and ears, was exactly 9 feet. On July 9 I reached Sesheke, where I was kindly and hospitably received by M. and Mme. Goy of the Paris Missionary Society. Sesheke is one of the four important towns of Lewanika's territory, and has a population of about one thousand. There are no native towns in the country bearing numerical comparison with such South African centres as Palapye, Mochudi, Ramutsa, or Mafeking. The district of which Sesheke is capital is governed by a niece of Lewanika, under the direction of his son Latia. This lady is presentable in appearance, but capricious, independable, and exacting, in so far as her dealings with her down-trodden subjects are concerned. However, she treated me with apparently genuine goodwill, acceding to my requests both willingly and effectively. On hearing that canoes would not be available for my future journey for some days, I asked her to give me a good hunter, and send me where game was plentiful. She gave me the best hunter in her district, and sent me to a veritable hunting paradise, where game had never been disturbed by either white or half-caste hunters. After being away ten days, of which eight were in the hunting veldt, I returned with nineteen head, comprising

twelve different species, while I had seen, but failed to bag, six other species.

On July 29 I left Sesheke with three canoes, my party consisting of twelve paddlers and three South African boys. I travelled slowly, so that I might take as many sextant observations as possible. Some 35 miles from Sesheke brought me to high banks covered with forest and teeming with tsetse fly. Such is the general character of the river as far as the southern extremity of Borotse. After travelling a further 12 miles, I had passed the three picturesque rapids known to the natives as Katima Molilo (fire-extinguisher), Mosila-wa-Ndimba (tail of the cepa, a wild cat with successive bars across the tail), and Manyekanza. There is a space of only about 2 miles between each rapid. Above



A HERD OF ZEBRA ON SESHEKE FLATS.

Manyekanza the river is about 800 yards wide and extremely beautiful, rocky rapids and tree-clad islands combining to lend life and grandeur to the landscape on the one hand, while on the other the peaceful stillness of a magnificent stretch of clear blue water was only disturbed by the occasional appearance of a large herd of hippos as they rose to the surface to take breath and to examine the operations on the bank, where my boys were pitching camp. Here I decided to remain and hunt the neighbourhood for a few days. The distance—some 50 miles—is frequently covered by canoes within twenty-four hours, but I had found the course of the river as supplied to me by the Society to be far from correct, and was anxious to take as many latitudinal observations as possible, with a view to checking my route-map, and to establish its accuracy so far as possible in the eyes of experts on my return to this country. Hitherto, as afterwards, I spared no pains to achieve this object, and, with the help of sun, compass, and chronometer, entered the direction of each estimated mile of the 2090 I travelled—exclusive of journeys I made for purposes other than geographical—

from the day I first crossed the river at Kazungula till finally recrossing it on my return journey.

At Sesheke I took five solar observations for latitude, placing it in $17^{\circ} 31' 18''$ S. lat. instead of $17^{\circ} 37' 45''$, a difference of about $6\frac{1}{2}$ geographical miles. Out of the eighteen observations I made during this 20 miles, seventeen at the time of taking seemed to me to be satisfactory, and coincided so accurately with my daily route-sketches as to leave no doubt in my own mind as to the general accuracy of the correction. My Kazungula latitude coincides exactly with its previous fixings; from that town, however, to Manyekanza the true course is considerably further north than existing maps place it. Here I spent a few days with the double object of hunting and examining the country on the west side of the river. Among other additions to my bag were a lion and a lioness, the latter of which, after an exciting hunt, died within 3 feet of the muzzle of my rifle.

On August 14 I reached the Ngambwe cataract. Here canoes have to be off-loaded and dragged some 700 or 800 yards over land. The following day I passed the Lusa rapids, where the river flows in successive rapids through innumerable small islands covered with trees, which in places meet overhead. Here and there the midday sun lent a dazzling brilliancy to the disturbed waters. The almost indescribable intensity of light and shade thus created reminded me more of my childhood's conception of fairyland than of any real landscape I have ever seen, and I doubt whether my eyes will ever again rest on a picture so gloriously perfect.

In the evening of the 16th I camped at the confluence of the Njoko (Monkey) river, which I proposed ascending for some 40 or 50 miles before proceeding northwards. This river is typical of the majority of rivers I met with on the north bank of the Zambezi. A clear deep stream winds through an open grass valley from 400 to 800 yards in width, which, though dry in the winter, becomes swampy in the rainy season. The soil is a mixture of rich alluvial and sand, growing excellent cattle pasture. The valley is skirted on either side by forest on white sandy undulations, unbroken for many hundred miles save by the intersection of other and similar river-valleys. I followed the Njoko as far as its confluence with the Rampungu, $16^{\circ} 42'$ S. lat.—a stream of extraordinarily transparent water about 15 feet wide and 4 to 8 feet deep. Here I camped, and was most hospitably received by the headman of a village there, who sent me large quantities of fresh milk—a luxury very seldom met with, owing to the prevalence of that cruel little pest, the tsetse fly. South of the Rampungu, which enters on the right side, the Njoko has no tributaries excepting the Luanza and Masibi, two small streams on the left. Both these, however, have a constant flow of water, though they cannot be more than 15 miles long, or I should have crossed them on my return journey by land two and a half months

later. This perennial flow of small tributary streams, though almost unknown on the South African plateau, is by no means uncommon in South Central Africa. Mr. Colliard, of the Paris Missionary Society, who has registered the rainfall on the upper Zambezi annually for several years past, tells me it averages out at about 34 inches, and is very constant; when in the early months of the rainy season the fall is below that average, severe storms at the close invariably raises it to within a point of 34 inches, and vice versa.

The day after leaving the Njoko I passed through the Romani rapids, not "falls" as marked in the maps. As proof of this correction,



THE ZAMBESI NEAR KASUNGLA.
(From photograph by Captain Neilson.)

I may mention that my canoes were not taken out of the water in passing them.

Having passed the Kali rapids, I camped on September 1 at the confluence of the Lunabi river, the course of which I followed for about 15 miles. A series of cataracts characterizes this river for 2 miles from its junction with the Zambozi, when it becomes similar to but rather larger than the Njoko. On the 3rd my canoes were off-loaded at the lower extremity of the rapids below the Ganya falls. Here the goods have to be carried and the canoes dragged over rollers for a distance of $2\frac{1}{2}$ miles, in order to clear the falls. Here a serious difference arose between myself and boys, who refused to obey my order to advance. After dismissing the two ringleaders with the intention of filling their places at Sioma, the native settlement near the falls, the remainder capitulated. Two days later the rebellious ones approached me submissively, and in bidding me farewell expressed their fears that Lewanika would kill them when he heard how they had behaved to me. They appeared grateful when I took them back

on the plea that I had no wish they should be killed. Henceforward I was obeyed implicitly. It is unnecessary for me to waste time with a detailed description of the Gonye falls, as they have been described by others. They are a fine sight, but lose much in effect by the meagreness of the surrounding vegetation.

A corn famine had compelled me hitherto to feed my boys on meat only. The natives, however, now reported that there was neither game nor corn in the Borotse plain. This made me not a little anxious, as I was even now past the good game districts. Good fortune, however, came to my rescue. After my boys had been for two days without any other food than boiled water-lily stems, I came across a large herd of buffalo, out of which I bagged three, making sufficient biltong to last for a week. On the second day after this I reached the southern extremity of what is frequently described as the Great Borotse "valley" ($16^{\circ} 15' S.$ lat.). Livingstone first spoke of the Borotse as a "valley," though "plain" or "flats" would convey a more correct idea of what in reality is a huge treeless alluvial plain in places 50 or 60 miles wide, and extending a very considerable distance to the north of Lialui, which stands 70 miles as the crow flies from the southern boundary of the plain. In the winter season the Borotse yields an excellent cattle pasture, and, being free from the "tsetse" fly, supports many thousand head of cattle. In the rainy season the river overflows its banks, converting the plain into a huge marshy swamp. The inhabitants build their villages and make their gardens on the mounds, which alone remain high and dry during the period of inundation. These mounds, many of which cover acres of ground, are the work of the white ant, whose marvellous constructive and destructive capabilities have so often been instanced.

The bed of the river here characteristically resembles what I have already described in the Sesheke districts—low banks, reed-bound and clean cut. Here, as there, the ibis, heron, pelican, plover, crane, and other species of water-fowl abound. I noticed three species of geese, teal, and many varieties of duck, though not in the quantities I had anticipated.

The Marotse who inhabit the numerous but small reed-built villages received me well, and with a degree of courtesy in many instances such as I had never before experienced from the African native, while the apparent satisfaction invariably following my answer to the often-asked question, "Are you an Englishman?" did not tend to decrease my sentiments of national pride, while I recognized an unconscious tribute to the character of David Livingstone and the few English travellers who had subsequently visited the country.

When within four days of Lialui, I received a letter from Liwanika, translated and written by M. Adolp Jalla, an Italian missionary under the auspices of the Paris Missionary Society. It expressed in curt

language the surprise of that monarch that I should have hunted without his permission along the Zambazi, and especially on the Njoko, which is a king's preserve. The epistle then peremptorily demanded that I should send per bearer the present the king exacted of all white hunters crossing the river, and terminated with the words, "and let it be a valuable one." The tone of this letter annoyed me excessively, more especially as I saw in it a possible defeat of the objects I had in view. I sat down at once, replying that I regretted the receipt of this letter; that Lewanika was apparently labouring under a delusion, as a message had arrived at Kazungula granting the permission he now thought fit to repudiate; that had I been aware the Njoko was a royal preserve, I would not have hunted there; and that I would see



CANOE CROSSING THE ZAMBESI.

him in a few days, when I would give him the present I had always intended for him and no other.

The next day I met my friend Captain Bertrand, on his return journey to Kazungula. We lauded, indulged in an hour's exchange of experiences, and then continued our respective journeys.

On the following night I camped at Nalolo, the town of the great Mokwui, or ruling queen. An interesting and ancient custom places this lady in the position she holds as being the eldest surviving sister of the ruling king. According to the unwritten constitution, without her advice and sanction her brother is debarred from giving effect to any important measure in the government of the state. In minor local matters she in her own district reigns supreme, holding the power of life and death over her subjects. She is at liberty to wed or depose a husband at will. In this respect the present lady has proved herself quite equal to the occasion. Her present husband is No. 7. None of the past ones, I am given to understand, ceased as such in the natural

manner. In fact, No. 8, who had earned for himself the universal respect of the people by his exemplary character and natural kindness, she herself stabbed to death, after she had appealed in vain to her young men to do the dirty deed for her. As he fell she contemptuously remarked, "Thus has a thorn been removed from my flesh." His fault was his popularity. Jealousy and envy are this woman's ruling passions. On the morning after my arrival I visited her, and I found her agreeable and affable. One passage in our conversation amused me considerably. Thinking to please the "mother," I alluded in laudatory terms to her daughter, the ruling princess of Sesbuke, and her husband. A free translation of the reply was, "Oh, they are merely



THE VICTORIA FALLS.

small fry. I and Liwanika, we are the big wigs in this part of the world." Not five minutes after my return from this interview, the Mokwai returned the call, followed by the usual escort in single file. I offered her my most comfortable seat—an ammunition-box—gave her a cup of coffee, and, contrary to my inclinations, tried to appear pleasant. After repeatedly, but ineffectually, pressing me to remain at Nalolo for three days, in order that I might shoot a hippopotamus and give her the fat, she bade me farewell, and I continued my journey.

That evening I left the main river and camped some 2 miles up a subsidiary stream, about 25 miles long, which, by a little native engineering, has been converted into a permanent waterway, passing within 2 miles of Lialui, and connecting the river 5 or 6 miles north of that town with its course below my camp. By means of this overflow

and a small canal cut from it, the natives are enabled to take their canoes to the town of Lialui itself.

At Lialui I found my friends, MM. Goy and Louis Jalla, assembled in congress with their fellow-missionaries of Nalolo and Lialui. By arrangement, M. Adolp Jalla—who with M. Colliard, the head of the mission, resides at Lialui—accompanied me on my first visit to Lewanika. A strong circular stockade surrounds a scrupulously clean courtyard, in the centre of which is the king's house, a neat oblong building about 45 feet long by 20 broad. Round the inside of the stockade are the huts of his wives, formerly twenty, but now only fourteen in number. A tall well-made man, very black, and neatly dressed in well-fitting European



THE VICTORIA FALLS.

clothes, raised his hat with an easy bow as we approached, shook hands, and, after exchanging the usual compliments, led us to the door of his house, waved us in, and then, placing M. Jalla on his left, gave me a seat on his right, in an old Portuguese chair (which he warned me was quite capable of collapsing if I didn't sit quietly), and himself sat down between us in a huge straight-backed armchair. Time will not allow of my narrating in detail either this or my several subsequent interviews with Lewanika. First we cleared up the misunderstanding which the letter previously alluded to showed to exist. It appears that he had expected my friend Mr. Reid to visit Lialui, and his inability to do so had conjured up suspicions in the royal mind that ulterior motives existed for both my friend's and my own presence. I assured him that Mr. Reid's objects were for hunting only; that when I parted from

him it was his *bona fide* intention to visit him; and that I expected illness or some very good reason had compelled him to alter his arrangements.

His next complaint was against a party of prospectors, who, in demanding to be ferried across the river with a considerable party of armed men, had behaved in an abusive and threatening manner. I explained that we Englishmen prided ourselves in being just and straightforward in our dealings with both white men and black; I was, therefore, very angry myself when Meruti (teacher) Jalla told me how these people had behaved. Though they were white, however, I was glad to say they were not Englishmen any more than his people were Matabili.

He then told me how his people had come in and reported that I had killed large quantities of game, and left their bodies to rot on the veldt. I reminded him that, owing to the famine, I had been compelled to kill much more than I otherwise would have done, or my boys would have starved. At the same time his people had wickedly lied, and that my boys, who were his servants, could tell him that not a mouthful had been wantonly wasted. Then followed a host of questions, such as, "Do the English people know of my existence?" "Has the Queen ever heard of me?" "What will the Queen do with me?" etc. I explained that white men, like myself, travelled so many miles from England in order to see for ourselves what happened in distant parts of the world; that we tell the English people what we see and hear; and that the Queen, who is good and kind, takes an interest in all her people, whether white or black; and that if he behaves straightforwardly to the English people, both the Queen and her government will see that no harm comes to him. By the natives of Central Africa the Great White Queen is looked upon as she is by her English-born subjects—as the embodiment of all that is good and kind and noble.

I should feel that I had failed in my duty to the memory of the first of modern African explorers if I omitted to give one passage of conversation with this chief. I had made up my mind that, whatever the consequences, it could not be wrong to be straightforward with him. When, therefore, I considered the time had arrived, I told him that my principal reason for visiting his country was to make a map of it. He was silent for a moment, and I feared he was about to raise objections to my "spying out" his country, as is the way of most Africans. Not so, however, for, raising his head slowly, he said, "It is a good thing to make a map of my country, for, though I am king, there are many rivers I know nothing about. When I was a little boy" (and he extended his hand to show the degree of his smallness), "I well remember a white man coming here and making a map of the river." "You mean Monare," I said, "What I want you to do is to help me to continue the work which Monare began when you were a little boy." He didn't attempt to

conceal the satisfaction my interruption gave him, and from that time all his suspicious little insinuations vanished, and he showed absolute confidence in me. Curiously enough, since the time Livingstone made his discoveries of the upper Zambezi in the middle of this century, no explorer or trader had succeeded in adding fresh geographical knowledge to his. To the native respect for this single-minded man I attribute Lewanika's confidence in me, without which I should have been unable to accomplish one-half of my work in the interior of his country.

After I had promised him a copy of my map, he thanked me and said, "And when I am dead, Latia and Latia's sons after him will remember you as the white man who made a map of their country."



QOXIE FALLS.

In character Liwanika, though his intentions are good, is inclined to be weak and suspicious. The dishonourable intrigues of two low-class white men, who found their way into his country some few years ago, for a time aroused grave suspicions in his mind as to the good faith of the English people. The two men, however, tripped, failed in their objects, and were banished the country.

In the earlier years of his rule, like most African autocrats, he was harsh and cruel. Now, however, he abstains from killing, except in the most aggravated cases of crime, and frequently errs on the side of leniency. To the example and influence of M. Colliard, the high-minded French missionary at Lialui, this change is mainly, if not entirely, due.

Some few years before his country was proclaimed to be in the sphere of British influence, he spontaneously expressed the wish that the Queen should become his sovereign, although rightly warned by M. Colliard that the advantages of white intercourse would be accompanied by a curtailment of his power.

Much of my time was taken up during my ten days' sojourn at Lialui with solar and astronomical observations. Unfortunately, while at Sesheke the small hand indicating the extent to which my chronometer had run down had become released from its pivot, and, wedging between the second hands, stopped the watch. By equal altitudes I ascertained the apparent time at Lialui, also my watch error, with the intention of using that place as a base for future longitudinal observations. The mean result of observations with my two boiling-point thermometers showed the town to be 3360 feet above the sea-level.

On September 30 I paid my farewell visit to Liwanika. He led



NEAR THE KATIMO NOBELLO RAPIDS, ZAMBESI.

(From photograph by Captain Herbert.)

me to his "kotla," where his chief men and the boys he had detailed to accompany me were already assembled. He then made it publicly known that I was travelling through this country as his friend, and that wherever I went, my headman was to order the people in his name to assist me. After making arrangements with him for a possible future expedition, I bade him farewell, and struck off due east for the watershed of the northern tributaries of the Zambesi. I cannot speak too highly of Liwanika's hospitality during my twelve days' sojourn at his capital. He placed at my disposal two large double-walled huts; a milch cow was set aside for my special use; a young ox was given me; and every day presents of fish, honey, sweet potatoes, or food for my boys were sent me. In addition to this, a chief daily presented himself at the door of my hut, bringing the king's greetings.

On the evening of the day of departure I camped on the borders of the plain, where the traveller leaves the malarious Borotse for the rising undulations of white sand and everlasting forest. Here I shot a new species of guinea-fowl, which will be described in due course. Seven or eight miles beyond the Borotse plain, and about 150 feet above its level, I discovered the basin of a lake, at that time of the year almost dry, which receives the waters of the river Kande. This lake is almost circular, and from 3 to 4 miles in diameter. In the rainy season, judging from the appearance of its shores, and according to the natives, it is filled with water, which must soak subterraneously into the plain below. The river, which is sluggish, flows through an open valley,



"BLUE WATER" LAKE, SOURCE OF THE KANDE.
(From photograph by Captain Fortrand.)

200 or 300 yards wide. I followed its bed for about 25 miles, when a bend from the south necessitated my leaving it. The river, however, in spite of appearances, cannot be more than 45 to 50 miles in length, otherwise it would clash with the Lui system. In three days I reached the Lui river, 63 miles from Lialui, in S. lat. $15^{\circ} 28'$. My boiling-point thermometers made the banks 3710 feet above the sea-level, a rise of 310 feet from the Borotse plain. Here I took observations for longitude, but the next day the offending indicator again rendered the chronometer useless, as well as the work I had lavished on it at Lialui. The river had to be crossed in canoes, and was apparently at least 30 or 40 miles from its source. Passing along the southern bank of the Maangu tributary, a deep narrow stream of clear water, I crossed the sources of the Luwowa and Koshamba, which flow into the Mutondo, the most important of the Lui tributaries, the sources of which I reached on October 7, in $15^{\circ} 27' 17''$ S. lat. and $24^{\circ} 39'$ E. long. approximately, after travelling

58 miles from the main river. The Mutoro rises on high ground, with much open country, at a height of 3980 feet, or 580 feet above the Borotse plain, from which it is about 82 miles as the crow flies. Thirteen and a half miles in a direction slightly north of east brought me to the source of the Lumbi, $15^{\circ} 28' 1''$ S. lat. Here I found game, and added to my bag, among others, a new species of hartebeest, hitherto unknown. Continuing my easterly course for about 4 miles downhill, I struck a small tributary stream, which led me to a sluggish river, flowing in a north-westerly direction through the usual open grass valley. My guide told me it was the Nyambe Noka, or "River of God," which flowed into the Luompa on the left bank. The Luompa is a tributary of the Luena, which, according to Liwanika, empties itself into a large lake two days' journey south of the confluence of the Kabompo and Zambezi. Future information showed me that the Luazanza, rising about $15^{\circ} 20'$ S. lat. and $25^{\circ} 30'$ E. long., also flows into the Luompa, left bank; so that the Luompa must rise further north, and the Luena probably still further to the north-west, its system completing the blank space in the maps bounded by the Kabompo, Kafukwe, Lui, and Lumbi watersheds, and draining this extensive area in an almost westerly direction.

Following the Nyambe to its source, $15^{\circ} 43' 7''$ S. lat., and 3860 feet (a drop of 60 feet from the Lumbi) above the sea-level, I travelled south for some 20 miles, to what the natives call the source of the Njoko river, crossing the Kashi, one of the largest of the Lumbi tributaries, on the way. The Njoko, however, cannot rightly be said to rise at this point, which is in reality the confluence of two streams, which, though dry when I reached them, evidently carry much water in the rainy season. I now decided to follow the course of the Njoko to my former camp at its confluence with the Rampungu. Above, as below that point, the river flows through the usual grassy valley. Owing to the absence of the tsetse fly, and the consequent suitability of the district for cattle-grazing, there are many Matutela villages and cattle-posts, presided over by Marotse chiefs, to whom the herds belong. The Matutela are the ironworkers of this black empire. It was on the Njoko, at the village of Serampunta, that I first witnessed a native blacksmith at work. One end of an iron cylinder is embedded in a charcoal fire. In the other end two parallel bamboos are inserted, each of them communicating with an otherwise air-tight earthenware bowl. Brayed skins of the softness of wash-leather, arranged loosely over the top of each bowl, are tightly tied round the neck with cord. To the centre of these skins sticks 3 feet long are attached, which a native, seated on a low stool, raises and lowers alternately, thus forcing a draught through the iron cylinder as effective as that created by the bellows of the English smith. A hard stone acts as anvil; two sizes of hammer, about 12 and 6 inches long in the head respectively, and iron tongs, complete the tool-chest.

On reaching my old camp at the Rampungu junction, I was much encouraged to find that (assuming the longitude of Lialui to be 23° S' E.) the route-sketch of my land journey from Lialui required no alteration to make it fit in with the section of the Njoko I had previously explored. Having completed the course of this river, I travelled in a south-easterly direction, striking the waggon track used by the missionaries in their journey to Lialui, in S. lat. 16° 34'. Reaching the Loanja—a sluggish river about 70 miles long—I followed its course for about 50 miles, thence to Seshoke, where I enjoyed a few days' rest with my kind friends M. and Mme. Goy. From Seshoke I travelled to Kazungula by land.



NATIVE BRIDGE ON THE KUIMBA.
(From photograph by Captain Birstrand.)

my route-map coinciding within a quarter of a mile with my previous river-map.

From Kazungula I visited the Victoria falls, about 30 miles down the river, which I travelled by the south bank. As I am unable to do more than simply corroborate Livingstone's description of this unique and imposing sight, I will hurry on back to Kazungula, whither I returned via Pendamatenka with my oxen-cart and reserve provisions.

I now determined to make an expedition north, through the Botoku into Boshikolumbwe, the land of the Mashikolumbwe. These people are very much dreaded by other tribes. They have a nice little habit of knocking their neighbours on the head if found within their borders. Strange to say, the natives of Kazungula, when I made known my destination, declined to court intercourse with these attentive people, and I began to fear that I would have to alter my arrangements, to the

detriment of the work I wished to accomplish. My failure became all the more probable when I found myself suddenly knocked down with dysentery, which at the end of a week reduced me to something little plumper than a skeleton. Then all at once boys came in offering their services as porters. This sudden change of front seemed strange, so I carefully asked each boy before engagement if he were willing to accompany me to the Mashikolumbwe, or to any other country I wished to lead him. Each boy answered in the affirmative, and by the time acute symptoms of the disease had passed everything was ready for a start. My kind friends the missionaries almost persuaded me that my expedition northwards was unwise, and that duty to myself dictated an immediate return home. When, however, I reflected that my oxen, which were very poor, would probably never take me through the desert, and that in all probability I should soon reach higher and healthier districts to the north, I quite persuaded myself that my plans were not so unwise as at first sight they appeared to be. So on December 17 I left Kazungula in continuance of my scheme. Two days later I crossed the Umgwezi, a river with deep-out banks and sandy bed, which, like such South African rivers as the Shashi and Maeloutsi, is as a rule but a succession of pools, but after rains carries down large volumes of water from the high plateau at its source. The crossing of this river in flood brought on a relapse of my illness, which, however, soon left me, and for the last time. It is not, perhaps, out of place to mention here how invaluable I found Messrs. Oppenheimer's palatinoid preparations. In this form the most nauseous drugs are not tasted, they are protected from the influence of damp, while their solubility is in no way impaired.

After tramping for four days through Mopani flats, ankle-deep in water, I reached rising ground, which led me to the watershed where the left tributaries of the Sejlefula have their source. I found I had ascended some 800 feet, and reached a country far surpassing any I had seen in Africa, and only to be equalled by what I afterwards discovered in Boshikolumbwe. Every mile or so a small stream flows through an open fertile valley. The vales yield abundance of corn to the Matulela who inhabit them, when the locusts permit its growth. On nearing the Sejlefula I entered the Matoka country. Where I crossed this river it flows through a picturesque broken country, down a rocky bed.

Passing three or four Machili tributaries, an easterly course brought me to tributaries of the Nanzela of the Kafukwe system, which soon led me to a large plain 3300 feet, and about 500 feet lower than the plateau I had left. This plain was swampy, and covered with mopani. After a week's wading, I reached the Nkala Mission station, on the river from which it takes its name, which was founded on the borders of the Mashikolumbwe country by two English missionaries, Messrs. Buckenham and Baldwin, some two years previously, in $15^{\circ} 53' 25''$ S. lat.

In crossing the Nanzela on the way, native engineering came into play. That river was in flood, and was about 150 yards wide and very deep. Felling the trees, which grew thickly, in such a way as to drop them in succession across the deep water, my boys formed a crude bridge, which enabled us to cross with only an occasional ducking to ourselves and my goods.

While resting for four days at the mission station, my porters commenced to show their hands, giving explanation of their sudden willingness to take service with me. They evidently thought that I was so much in their hands that a unanimous refusal to go forward would compel me to go back. We had now reached the outskirts of the



NEAR THE UPPER MAROTSE RIVER.
(From photograph by Captain Bertrand.)

dreaded Mashikolumbwe, among whom Liwanika's friendship did not guarantee immunity from attack, as had already been unfortunately proved when Dr. Holub in 1885, and Mr. Selous in 1888, attempted to enter their country. Yet I have always held, and do so still, that the difficulties of African travel are exaggerated, and that apparent impossibilities vanish often even before met. In this case I was stimulated by the sight of the fine broken rising country stretching to the north, and I determined to see something of it before returning.

My boys had told Mr. Baldwin that nothing would induce them to cross the river (the Kafukwe I imagined them to mean, though subsequent events proved that they referred to the Mosa, a tributary and boundary of the Edzumba tribe). I therefore modified my plans, and decided to keep the Kafukwe on my right until I reached some chief

who would supply me with a few porters to accompany me to the east. On giving orders to my porters to get their loads ready, a deputation came to ask me where I intended going. I simply told them that, as they had each agreed to accompany me wherever I wished to lead them, the matter did not concern them; that it was for them to obey me, and for me to give them their pay when they had fulfilled their engagements. In the evening we started, and I led them in a north-westerly direction. After a gradual ascent for three days, through an increasingly fine country, I struck the Musa, a clean-cut, high-banked river, similar in character to the Ungwezi. This river flows towards the Kafukwe in a direction about 20° north of east. From its size and direction, it must rise within no great distance of the Njoko source. I therefore conceived the idea of following it thither, and connecting the map of my present with that of my previous journey before going deeper into Boshikolumbwe. But the proverb, "Man proposes, God disposes," is more intensely true in unexplored Africa than in civilized Europe. After following the Musa river for a couple of days, I crossed to its northern bank and halted for the hot hours. On preparing to proceed in the afternoon, I found myself deserted by all my porters but two and my three South African boys, two of whom were more dead than alive with fever.

Since, whatever course I adopted, it would be difficult to place myself in a more embarrassing position, I soon decided on my future course of action. That afternoon I shot a couple of zebra, which were brought into camp and cut into strips for drying; pitched my tent over my goods and chattels; and next morning set off in a north-easterly direction for the interior of the Mashikolumbwe country with three boys and a scant supply of provisions, leaving the two sick ones to keep guard over my goods and eat zebra meat till my return. For four days I passed through a magnificent, well-watered, scantily populated country. A cluster of villages known as Edzombe contained the only human beings I saw. Here woman's curiosity took effect in something of a friendly demonstration. Not so the warriors whom I passed *en route*; they went by without even a salute, and scarcely a glance, armed *cap-à-pied* with bow, poisoned arrows, assegai, and axe, and clothed in a necklace only. Before, however, I had left the villages a mile behind, an eland I bagged attracted a group headed by their chief, who was clothed in the same unostentatious manner as his subjects. Meat among savages has a similar effect to that of gold elsewhere, and these gentry became quite friendly. Passing out of the Edzombe country, I came to that of Kaiyugu. This chief ostensibly received me well. He thanked me for coming so far to see him, and at once promised to send boys to my Musa camp and bring on my things. The interior of a strong stockade, inside which his people and cattle were mingled on the evening of my arrival, had a picturesque effect, which was somewhat enhanced, after

the usual exchange of compliments, by the appearance of a dreamy-looking native draped in a flowing blue and white check robe, who seated himself opposite and sung out an impromptu song in my honour, to the accompaniment of a large native piano, which gave out by no means unpleasant music through the medium of ironwork and various-sized calabashes.

After being kept here for about three weeks under pretences of sending for my goods, I discovered that the old scoundrel Kaiyngu had not so much as sent a single boy, and was simply preventing my departure on account of my success as purveyor of meat to his Majesty. This trick did not please me when exposed, the more especially as,



A MA-TOTTELA VILLAGE

(From photograph by Captain Buxton.)

for the latter half of my sojourn with him, I had been entirely dependent for food on my rifle and wild roots, the famine previously alluded to having depleted the country of everything else edible. He was brought to his senses by a thorough scolding, in which I hinted at a raid from Lewanika when he heard how ungratefully I, his friend, had been treated; for had I not made him and his people fat when others were starving? and had I not made him valuable presents—penny spoons, twopenny scissors, and I know not what? So he arranged to give me three boys to help my two (for Muliphi, one of my Bawangwato boys, had previously left for my camp as a guide, but had not been heard of since) to carry my trophies, etc., to my Muza camp.

I left that day. A piece of good fortune led me past a small stockade, where I found Muliphi a prisoner, robbed of his blanket and assegai. Two days later this foolish boy, in spite of frequent warnings, lagged behind, and was cut off and robbed by these treacherous people.

who must have been following on my spoor for that purpose, as I was then far past the last village. The night but one after, Kaiyngu's three beauties deserted, taking with them all they could lay hands on, though nothing of value, save a few curios I had collected for ethnographical purposes. The next day I reached my camp, and, contrary to expectation, found it had not been raided. Finally, with the help of a few friendly Mankoyas, whom I fell in with, I reached the Nkala Mission station in safety.

Now, just one word about this northern Mashikolumbwe country. It is high, healthy, well watered, and pleasing to the eye. While at Kaiyngu I made excursions in all directions, and was charmed with all I saw. I crossed the Kafukwe there, and travelled about 150 miles in the country to the east. After a gradual ascent from either bank for about 5 miles, the altitude is over 4000 feet. The river itself approaches the Zambezi in grandeur. In the neighbourhood of Kaiyngu it is about 400 yards wide, picturesque, clear, and deep. To the north of Musanana, for at least 100 miles, the banks are high, dry, and healthy. South of that place they are low, swampy, and malarious. At Musanana I found hot-water springs—186° Fahr.—which the deposit I brought home shows to be calcareous.

Great excitement prevailed among the natives in the vicinity of the Mission station when I arrived, owing to the conduct of a man-eating lion which had taken up his quarters in the neighbourhood. At about two one morning I was roused by Mr. Baldwin with the news that this animal had broken into the cattle kraal and killed an ox. Five times that night I made unsuccessful attempts to get at him, but the darkness prevented my getting a fair shot.

The next morning, however, I followed on his spoor and bagged him near the carcass of the ox he had dragged away. The latter part of his life had been short but merry. Within thirteen days of his death his menu included two women, two oxen, two donkeys, a sheep, a goat, and a lamb. He was abnormally large, and appears to be the second record, so far at least as height goes, measuring 43 inches at the shoulder; pegged-out skin, 12 feet 1½ inch.

Engaging porters, I left the Mission station, following the Kafukwe to where it makes its easterly bend, and crossing the great Botoka plateau some miles to the east of my old route, where I found open country over 4000 feet. Following the Umgwezi to within a few miles of my original crossing, I reached Kazungula in a barefooted condition. On the last night but one of my journey two Mashikolumbwe porters deserted with their loads. I have no doubt, however, they have lived to regret their crime, for Latia sent special messengers after them, and native justice is usually severe.

The surprise evinced at my reappearance among the natives round Kazungula was not so remarkable as at first it seemed. It appears my

absconding porters had so convinced themselves that my five boys and myself would fall victims to Mashikolumbwe treachery, that they were not afraid to give the following as an account of their adventures. When on the borders of the Mashikolumbwe country, they reported, I shot the five boys who did not return with them while they slept at night. The report of my rifle, however, awoke them from their sleep, and they only just managed to escape a similar fate by flight. When asked what had become of me, they replied, "Oh, the white man disappeared among the Mashikolumbwe, and has never since been heard of." Of course, the appearance and testimony of the resurrected faithful ones gave the lie to this extravagant falsehood. I was more annoyed



GLADE IN MASHIKOLUMBWE LAND.

at the invented calumny than the desertion itself, and on this ground I advised Latia that the delinquents should be severely punished—and they were; the whole town was turned out to flog those who resided in his district, and Lewanika was communicated with for the benefit of those who had returned to Borotse. Had anything occurred to terminate the existence of myself and boys, this tale would have eventually reached England, and I can quite conceive a certain class of paper, in its anxiety to credit the uncharitable, holding this up as another instance of the white man's atrocity to the helpless savage.

Most fortunately for me, Kazungula, where I had left my cattle, was not yet affected by the rinderpest scourge. A small space within a radius of about 20 miles of that place was as yet untouched. The natives reported that the epidemic had crossed the Zambezi and

Linyanti, and spread far south. Six weeks before M. Goy at Sesheko had lost one hundred and twenty head of cattle, all he possessed; and whole herds of buffalo and other ruminants had perished. I afterwards found that it had crossed the river to the east as well, spreading to Buluwayo and further south, where the eastern and western columns of disease joined in their advance on Khama's country and beyond. Thus a narrow strip of country about 400 miles long, through which my journey through the Kalahari lay, alone remained unaffected. I swam my oxen across to the south bank at once, and paid a hurried visit to Sesheko to fetch the bulk of my trophies, which M. Goy was kindly looking after. Little did I think that the first piece of Zambezi news to reach me in England would announce the death of this good man after four days of Zambezi fever.

On March 12 I left the Zambezi, the very day on which the disease first broke out at Kazungula. And now commenced the hardest five weeks of my life: a journey through the Kalahari with six oxen to do the work of ten; two boys who were so knocked to pieces with fever that I was compelled to drive my own cart; and only a few pounds of rice and oatmeal to live on, for through a theft my meal had given out. The absolute necessity of driving my oxen all night, and by night only, placed hunting beyond the range of physical endurance in the daytime. One extraordinary instance of good fortune I must not leave untold. About three days before I reached the borders of Matabeleland in April, my boy lost the oxen for two and a half days. This delayed me three days, and, as I afterwards found, just gave time for all the Matabele, and such Makalakas as had decided to join them, to quit the kraals in front for the Buluwayo district before I reached them. They killed a white trader before they left, and, ignorant as I was of the rising, had it not been for the delay I should in all probability have shared his fate. My gallant little team took me safely to Palapye, where I packed my trophies into cases, and, leaving them in the hands of my agent with hopes that they will some day reach England, I hurried on by post-cart with a view to catching the ill-fated *Drummond Castle*. Fortunately the *Arundel Castle* was a few days late, and I took my passage in her. I feel I should fail in my duty were I not to pay grateful tribute to that Providential hand which undoubtedly guides and protects those who humbly strive to do their best.

The confusion of the prefixes Ma-, Ba-, Bo- makes it advisable that I should give an explanation of their meaning, as corroborated by four friends of mine—three missionaries and a trader—all of whom are thoroughly conversant with the language and customs of the people.

Ma- signifies the people—Marotse, Matoka; Ba-, a single individual—Barotse, Batoka; and Bo-, the country—Borotse, Botoka. Our parallel is the English, Englishmen, England.

I will simply give a few distinguishing characteristics relative to the tribes I travelled among. Their tribal distribution is to be found on my map. In colour they are all—with perhaps the exception of the Mashikolumbwe—much blacker than the South African. Almost throughout I noticed an inferior type of native, varying little in different districts, who have probably much common blood derived from an aboriginal race occupying the country prior to the Bantu incursion. These people I exclude from the following remarks.

The *Marotse* are the ruling tribe. Each Barotse is a chief by birth. Their physique is good; manner dignified and courteous, though they have not learnt the art of telling the truth—a general failing among their neighbours. They are very clever at wood-carving, considering the crudeness of their tools.

The *Mabunda*, a shorter but thick-set race, are very clever in the art of basket and mat making.

Among the *Matutela*, I was struck by the number of tall slight men, with good features and long pointed beards. They are the iron-workers of the empire, and supply their neighbours with assegais, axes, knives, etc. They also almost monopolize the canoe-building industry.

The *Mambia*, many of whom are of magnificent physique, supply most of the paddlers on the Zambezi. They are a hunting people.

The *Matoka* are men of good physique, make good porters, and cultivate cereals largely.

The *Mankoya* are a race of hunters, are shorter than their neighbours, and, though generally supposed to be inferior, I must confess I was agreeably surprised with them. They use poisoned arrows, which are also carried by every *Mashikolumbwe* warrior. The physique of the *Mashikolumbwe* is, so far as I was able to judge from six weeks' contact with them, their only good quality. They are a treacherous, indolent people, too lazy even to hunt. The cone on the back of their head distinguishes them from all other tribes. They also knock out the four upper central teeth and the back lower ones, giving themselves an ugly undershot appearance. This latter disfigurement is also resorted to by the *Matoka*, though by none of the other tribes, except the *Matutela* and a few *Mankoya* on their borders. The *Marotse* file their two front upper teeth, so as to form a reversed V.

A JOURNEY UP THE MACHILI.

By PERCY C. REID.

THE road from Mafeking through Palapye, the residence of Khatisa, the chief of the Bechuanae, to Kazungula at the junction of the Zambezi and the Linyanti (or Chobe) river, has already been frequently described, and I will therefore say nothing about it, but commence with Kazungula as our starting-point. Kazungula is an ordinary African village of the usual type, composed of circular huts built

of mud and wattle, with thatched roofs. It is a village of quite recent construction, being only some six years old. Formerly the nearest village was at Mbôfa, some 8 miles up the Zambesi, which, when I visited the country last in 1888, was under the charge of a headman named Makumba. Since then, however, contact with Europeans has largely increased, and a mission station was founded at Kasungula, with the result that the place became sufficiently important to induce Idin, the son of the chief Lewanika, to take up his residence there, and to remove his subjects from Mbôfa to the new location.

Starting from Kasungula on July 2 of last year, Captain Bertrand and I set out with the object of combining sport with a rough survey of the Machili river, which flows into the Kasala, and thence into the Zambesi a short distance south of Sesheké. It took us three days to reach the Kasala river, our march being sadly delayed by want of carriers and by unbroken donkeys. Our route so far had led along a well-beaten path and the waggon-track of the missionaries, leading to Sesheké and away on to Lilalul, the capital. After crossing the Kasala, however, we soon struck the Machili, and were then in unsurveyed country.

And here perhaps I may break the narrative of our journey, and, taking you at once to what we afterwards found to be the source of the river, may describe it from thence downwards, as this will render what I have to say clearer and more interesting. The Machili rises on the southern slope of a high sand-ridge, at an altitude of about 3900 feet above sea-level. There is no absolute source, such as a bubbling spring, but merely a slight ill-defined valley about 100 yards wide, carpeted with grass and edged on both sides with forest. As one follows down the valley, it is joined by other small valleys similar, but smaller, and chiefly on the east bank, and at the junction of these with the main bed the ground becomes wet and oozy. The descent is fairly rapid, say 50 feet in a couple of miles, and then comes a slight outcrop of stones, and the first real water is found in a few rocky pools in the river's bed. The course is north-east to south-west, and in a few miles the sides of the valley have become steeper and the river full of water, in which a current is plainly visible. Some 5 miles down a considerable stream joins the Machili from the east, and a large pool is formed at the junction, and below this the river is flowing strongly. Following the same general direction lat. $16^{\circ} 21'$ is reached, and there, after emerging from stony ground, the valley opens out to a width of some 150 yards, and the river itself gradually dries up, and is soon quite lost, except for one or two stagnant pools in its bed. Some few miles lower the country on either side becomes again stony, and the river at once reappears, and, gaining volume, is soon running rapidly and noisily forward, in many places like a Scotch burn. About lat. $16^{\circ} 35'$ it makes a sudden and sharp bend to the east, and, after flowing some 6 or 8 miles in this direction, emerges from the stony hills on to a wide "turf" valley (with an altitude of about 3400 feet), where it again suddenly bends to the south and becomes apparently stagnant, and in places almost dry. Another and similar but smaller bend to the east and then south occurs in lat. $16^{\circ} 48'$, the valley again contracting and a certain flow of water becoming perceptible. From this point onwards for some 45 miles the same characteristics prevail, and then again the river becomes a series of deep pools with dry spaces in between. Here the river has become sufficiently large for the pools to contain hippopotami. The country now has become flatter, the valley of the river has disappeared, and the river continues in alternate pools and dry spaces until some 5 or 6 miles before the Kasala is reached, when the pools of water cease entirely, and the river-bed itself also vanishes utterly. Of course, I am speaking now of the dry season. In the rains the river is full of water and flowing throughout; but the curious fact

remains that when I saw it, it was alternately flowing and stagnant, and that even in the wet season it empties itself into a large marsh, which in its turn drains rather than flows into the Kasai. Wherever the subsoil is rocky and the fall somewhat pronounced, there we find water running throughout the year; where the country becomes more level and the soil alluvial turf (it is nowhere sandy), there the river is represented by pools, or loses itself entirely.

Viewing the river from its mouth upwards, the rise is very slight until you reach lat. $16^{\circ} 35'$, when you first get really out of the Zambesi valley and into stony hills. Rising through these, you find beyond them a main high sandy ridge, which forms the watershed between the Kafukwe river and the Zambesi. This ridge runs approximately north-west to south-east, and is the origin of all the rivers flowing into the left bank of the Zambesi between Kazungula and the capital Lialui.

Vegetation throughout the country traversed is thick. In the alluvial parts it consists of high forest trees without much undergrowth; in the more stony and barren parts the forest is smaller and the undergrowth thicker—in places almost impenetrable jungle. Temperature in the winter months is very pleasant—about 80° to 85° in the shade at midday, and with cool refreshing nights. We experienced a sharp frost on July 31 at the source of the river, in lat. $16^{\circ} 9'$. Population is sparse, but it is hard to judge population in Africa, as the villages are hidden away in the bush, and the natives rarely show themselves. Several tribes that go to form the Barotse nation inhabit the district. They cultivate several sorts of cereals and pulses, as well as tobacco, pumpkins, and several sorts of roots. They are clothed, if at all, in skins, and use skins to cover themselves at night. They are all armed with assegais, a very few have guns, still fewer have ammunition, and one tribe, the Mankojas, all carry bows and poisoned arrows. They are nearly all adepts at trapping game, either in pitfalls or snares. They are quite peaceably disposed, shy by nature, but soon become used to the presence of white men. They are indifferent carriers, and desert on slight provocation; but they rarely steal their loads, although they abandon them by the road. They are destitute of pluck, and would be of no use in a time of danger.

The game of the country is, or was, very numerous. I say "was," because I am sorry to hear that the rinderpest has devastated Barotseland as it has Matabeleland and Mashonaland, and that the game now is practically extinct, the carcasses lying rotting in all directions. Elephant are very scarce—I did not see one; rhinoceros scarcer still; hippopotami are found in the Zambesi and Machili; while all over the country were buffalo, Burchell's zebra, many sorts of antelope, and many lions. Neither giraffe nor ostrich are found east of the Zambesi.

I thank you for the kindness with which you have listened to me, and if, as I hope, I may some day be able again to visit this part of the world, I will endeavour to bring back a larger and more valuable store of information on its geography and ethnography.

FROM THE MACHILI TO LIALUI.

By Captain ALFRED BERTRAND.

AFTER the exploration of the Machili, in which I accompanied Mr. Reid, I determined to traverse the Barotse country in a north-westerly direction to Lialui, the residence of King Lewanika.

Taking with me twenty-five men and (as interpreter) an old half-caste elephant-

hunter, Klass Africa by name, I set out on August 1, and camped at nightfall on the bank of the Kakoma, a right-bank tributary of the Machili. The following day, after crossing the swampy bed of another tributary of the Machili (where we sank up to the knees in mud), we passed into the basin of the Njoko, and camped in the ravine of its left-bank tributary, the Mania. Our way had been a constant succession of ascents and descents. During these two days we had not met with a human being, nor seen a trace of habitations. The larger game, too, was exceedingly rare, and appears to migrate to other districts at this season of the year, for during our ascent of the Machili we had seen abundance. After crossing the Mania on the third day, we reached a collection of huts on the boundary-line between the districts of the Mankola and the Matotela. The latter, whose territory we now entered, are a decidedly superior tribe to the former. Here we rested a day, camped on the left bank of the Njoko, in a grove of fine "moteaoli" trees. The foliage of the "moteaoli" is of a dark green, and it bears a red fruit, like a flattened bean, much relished by the natives. Here I held a market, and obtained a good supply of sorghum, ground-nuts, etc., paid with beads.

The valley of the Njoko presents a pleasing appearance, bounded as it is by wooded hills, on the slopes of which brown patches are to be seen here and there, representing villages surrounded by their plantations. I was struck by the resemblance of certain of the Matotela with the Jewish type. They are in the habit of extracting their two front teeth, whilst the Mashikolumbwe take out four. They are very scantily clothed; as weapons many of the men carry, in addition to the barbed spear, a more slender tapering one, with which they take fish. We paid a visit to the residence of the chief Siboupa. An enclosure formed by trunks of trees, 8 to 10 feet high, contained a large central hut, surrounded by eleven smaller ones. They are round, built of reeds, and covered with thatch. Within the enclosure was a blacksmith and some small granaries raised above the ground. By the river-side were herds of cattle, composed of two kinds—the Mashikolumbwe breed small and with short hair and horns, and that of the Barotee, which is much larger.

The following day we passed over to the right bank of the Njoko, the water scarcely reaching to our knees. During the rainy season it is navigable as far as the Zambezi. We visited a chief named Surukurukuru, from whom we obtained a guide. Near his granaries we saw three great balls of sorghum bound round with lianes, destined as tribute to Lewanika. In the afternoon we passed through a forest of tall trees, and camped on the bank of the Kamibona, a right-bank tributary of the Njoko. The next day we reached a charming little lake, surrounded with verdure. I named it "Blue Water," on account of its lovely colour. It forms the source of the Ikue. Here a second guide was sent to us by the chief.

On August 7 the thermometer registered 36.1° Fahr. at 6.30 a.m. After crossing a broad ridge, we reached the valley of the Njenjo, a left-bank tributary of the Lumbi. The water is clear and rapid, and too deep to be forded. We crossed by means of a awaying bridge, roughly made with a few branches. During my frugal morning repast one of the Mankola brought me a delicious comb of wild honey, which he had found by following the bird called "honey-guide" (*Euculus audimtor*). During the last two days we had seen no trace of human beings.

On August 8 we reached the Lumbi, flowing in a valley, broader, but less rich than that of the Njoko. Before crossing, we halted at the village of the chief Natumba, for the purpose of laying in supplies. Here we struck the track used by the missionaries when journeying by land from Kazungula to Lialui, and we subsequently crossed it several times. Before reaching the main channel of the Lumbi, we floundered about in the sticky mud of its swampy margin. The

river itself we crossed by the help of two canoes. I had in view some wildebeest (*Catoblepas goryoni*) and some Lechwe antelopes (*Colobus Lechwe*). In the evening my interpreter, Klass Africa, was seized with a severe attack of fever. Several of the men also deserting, as well as the two guides, my situation became serious. However, a vigorous harangue to the men put a stop to the desertions, whilst Klass Africa was so far improved on the following day as to be able to march. The nature of the country now changed greatly, the ridges becoming more widely separated. On August 10, at 6 a.m., the thermometer registered 34° Fahr.; while yesterday, 8 p.m., put at the same place, just in the sun, it showed 106° Fahr.

On August 12 the thermometer stood at the freezing-point at 6 a.m. The country continued on the whole similar in character, but the surface became sandy and tiring to walk on. We found water in a well, before crossing a wide plain covered with ant-hills, hard as a rock. On the 13th we had another experience of swamps and mud on the banks of the Luj. On the 15th the country became more and more thickly peopled, and much cattle was seen. A wide plain extended westwards, dotted with the round huts of several large villages. The women were engaged working in the fields. The following day we reached the well-cultivated valley of the Sefula, and arrived at the mission station Sefula, founded by Mr. Coillard in 1886. He had preceded us to Lialul, the capital of the Barotse kingdom, where we arrived on the 17th, after crossing a great plain, inundated during the rains. All the villages are here built on rising grounds.

The country traversed may be broadly divided into two sections—

(1) The portion of the Barotse kingdom lying between the rivers Machili and Lumbi, which, according to the account of King Lewanika, had not at that latitude been previously traversed by a white man. A succession of wooded ridges are separated by valleys, in which flow the three large rivers, Majili, Njoko, and Lumbi, with their affluents.

(2) Beyond the Lumbi the surface features differ. The ridges being further apart, the streams are less numerous, the two most important being the Motondo and Luj, which unite before joining the Zambesi. There are several larger lagoons, which receive the surplus water of the Zambesi during the rains.

Thanks to the missionaries, my stay at Lialul was full of interest, and I could gather many informations about the Barotse country. One of them accompanied me on my visit to the king, for the purpose of handing over my presents to him. Before the arrival of the missionaries, only a few years ago, infanticide was openly practised at the capital, but it is now perpetrated in secret only. Mr. Coillard, amongst numerous blessings, has also succeeded in abolishing the ordeal by boiling water. I also visited the mission station of Nalolo, on the right bank of the Zambesi. This place is one of the most important centres in the Barotse kingdom. It is the residence of the queen "Mokwal," the king's elder sister, who in this country shares his prerogatives. A wide sandy plain extends from hence westwards as far as the Lhuyanti, or Olobo river. From Lialul, a seventeen days' journey in native canoes took me down the Zambesi to Kazungula.

Sir Jorx Kinn remarked that he could speak from personal knowledge of only a very small part of the region that had that evening been described. It was his good fortune, in 1860, to be the companion of Dr. Livingstone from the East Coast to Sesheke, then the seat of government of the Makololo kingdom. On this journey they crossed the southern part of the Batoka highlands, at an elevation of 3000 feet. The change in climate on leaving the sultry, damp river-valley was now very marked; the nights on the plateau were cold, and on several occasions while they slept out, the ground was covered with hoar-frost and the water

frozen. Looking south across the Zambezi valley, one of the fairest views presented itself, bounded on the far horizon by the blue ridge of the Matebele hills clearly visible. The Batoka people had been at that time almost exterminated or driven far off by the marauding Matebele from the south, and by the Makololo, who had made themselves masters of the country. On the higher plateau no villages were seen, but many remains, to show how far advanced the natives must have been above those of any other part of Africa he had visited. There were plantations of three kinds of fruit trees, some which were arranged in avenues, and had distinctly been planted and carefully attended to. Of these, one yielded a seed like a pea, with juicy red coat, which was considered very nourishing; another resembled a modlar; while a third bore a nut that tasted like a walnut. Some of the above could not have been less than a hundred years of age, showing how long the Batoka tribe must have remained in peaceful possession. The Batoka also possessed a small domesticated race of cattle, very different from the great coarse long-horned animals of the Barotse valley and of South Africa generally. As to the resources of the country, traces of the presence of coal and iron were frequent.

In view of the time when the country to the south comes to be opened up and developed, especially if, as is proposed, a small part of the vast energy of the Victoria falls is turned to account, as has been the case at Niagara, the healthy, pleasant Batoka plateau must attract Europeans, who will find there an escape from the deadly feverish swamps and river-valley, which make it doubtful how few Europeans can ever turn to profitable account the rich soil of these malarious regions.

Mr. HAVESBEEK said the paper read to-night abounded in matter of interest. This country as far as the Kafukwe had, no doubt, been visited long since by "Portuguese" traders from Bihe, and subsequently by missionaries and sportsmen, but the maps now placed before them presented them for the first time with a trustworthy delineation of it. Captain Gibbons's extensive journeys were checked by numerous observations for latitude; Mr. Reid had substantially added to our knowledge by his survey of the Machili river; whilst Captain Bertrand's journey from the head of that river to Lialui had connected the routes of his fellow-travellers, and filled up a vacant space upon the map. He had carefully computed the altitudes, and it appeared that no part of the country visited had an elevation of less than 3000 feet. He believed that Lake Ngami likewise would be found to lie at that level, although Chapman placed it at an elevation of only 2240 feet above the sea. The determination of altitudes in that part of Africa was, however, attended with considerable difficulty, and only approximate results could be secured until a meteorological station should have been established, to which the observations of travellers might be referred.

Mr. ALEXANDER KEEN: It may be of interest if I state that in my capacity as map curator in the Intelligence Division, all astronomical work communicated to the War Office comes to me to be worked out or examined and checked, as the case may be, and in this way Mr. Reid's observations reached me. He fixed the latitude of Kazungula by four determinations on four consecutive days, and, so far as I remember, the four results were in singular accord, the greatest difference between them being only a few seconds; and therefore Kazungula, the point from which these expeditions diverged, may be considered as fairly well fixed in latitude.

Admiral WILKINSON, Vice-President (in the chair): One thing that has struck me very much in the interesting account we have heard to-night is the advantage of following in the steps of a good traveller. There are, unfortunately, travellers who, with what the ladies will probably consider the principal characteristic of

man, selfishness, pass through a new country entirely regardless of the welfare of others, sometimes with fire and sword, and leaving a legacy behind them, which is very bad for those who follow. But in this case the mere name of one who had passed that way many years before, Livingstone, made the path smooth and cleared away all difficulties. It is an eloquent tribute to his character.

The papers we have heard to-night show the advantage of travellers working together. They have crossed the same country by different tracks, and the result is the admirable map of it we have before us. Captain Gibbons especially has taken great trouble in carefully mapping the country, and I must express great sympathy with him for the mishap to his chronometer. I know nothing more annoying than to have all your labour in taking observations for longitude thrown away by the misbehaviour of your timekeeper, but he has shown great skill in repairing the break in his line of positions, so far as it could be done. I must also note my sympathy with him in finding that the rinderpest had necessitated regulations on the part of the Cape Government which obliged his leaving his collections behind him, and whether he will ever get them is very doubtful.

The fact that the thermometer falls as low as the freezing-point in a country in so low a latitude, and at an altitude of a little over 3000 feet, is very interesting, and gives good hope of this country some day turning out capable of permitting white labour, though we shall probably none of us see the day.

I am sure that you will all join with me in passing a hearty vote of thanks to these gentlemen for their interesting papers.

NOTES ON THE MAP.—The map accompanying the above papers is to the greater extent based upon a survey by Captain Gibbons, checked by the latitudes of fifty-four places determined by meridian altitudes of the sun or of a star. These latitudes, which were re-computed by myself, inspire confidence. They not only are concordant, but also agree with the results of former travellers, and more especially those obtained by Dr. Livingstone. Thus, whilst Gibbons places Sasheke in lat. $17^{\circ} 31' 19''$ S., Dr. Livingstone, whose observation was made on the southern bank of the river, obtained a latitude of $17^{\circ} 31' 38''$ S. I do not understand the grounds on which Livingstone's latitude for that place has been rejected by certain map-makers.

The longitude accepted for Lialui is dependent upon the observations made by Dr. Livingstone (at Naliele) and Serpe Pinto (at Katongo), the meridian distance between these two places being assumed to amount to six minutes. Kazungula, below the confluence of the Zambezi with the Kuanda, has retained the position assigned to this locality on my large map of Equatorial East Africa, published by the Society in 1881, viz. $23^{\circ} 12'$ E.

The Machili river has been inserted from a map furnished by Mr. Reid, checked by the determination of latitudes of fourteen places. These latitudes were re-computed by Mr. Reeves and myself, and inspire every confidence.

Captain Bertrand's route from the head of the Machili to Lialui is based upon a sketch-map supplied by that gentleman.

All the altitudes inserted upon the map are from boiling-point observations made by Captain Gibbons and Mr. Reid. These have been computed by me to the best of my experience, but the results can only be looked upon as being approximate. The tribal name, Mahunda, inadvertently omitted by the lithographer, should be inserted between Lialui and Makwanga.

F. G. R.

EXPLORATIONS IN MYSIA.*

By J. A. R. MUNRO and H. M. ANTHONY.

THE following paper is based upon notes taken on a journey in the autumn of 1894 through the country described. The party consisted of Professor W. C. F. Anderson, of Firth College, Sheffield; Mr. H. M. Anthony, of Lincoln College, Oxford; and myself. Our original intention was to ascend the valley of the Rhyndacus, and strike north-eastwards from its headwaters across the Sangarius to the Black Sea. But the prevalence of cholera in that direction, with its baffling cordons and quarantines, compelled us to change our plan and confine ourselves to the western districts. It will be noticed that our tortuous route, sufficiently explained by the accompanying map, often brought us back near to places which we had passed before. From one point of view this fact is a great advantage, for it enables us to check our geographical observations on one road by those on another, and by no other course could we have got any tolerable idea of the complicated hill and forest country of the interior. But, on the other hand, it makes our itinerary a very unsatisfactory basis for purposes of description. It seems better, therefore, to follow the natural divisions of the land, and leave the map to speak for itself. Our account will then fall into three parts—

I. The plains and lakes.

II. The Macestus valley.

III. The hill country between the Rhyndacus and the Macestus.

Of these parts Mr. Anthony has contributed the third; I have written the other two. The map owes much to the skill and pains of Mr. B. V. Darbishire, who has set forth in a special note the principles and materials on which it is based. An unfortunate accident to our aneroid and the uncertain state of the weather render our readings very untrustworthy. We have not thought it worth while to record the altitudes calculated from them on the first portion of our journey, and although the instrument was put right before we set out for the second time from Brusa, those given must be accepted with caution. They have, perhaps, little more than a relative value. The extent of our debt to Mr. W. M. Ramsay's 'Historical Geography of Asia Minor,' and to Kiepert's excellent map, will be obvious on every page of this paper.

I. THE PLAINS AND LAKES.

(By J. A. R. Munro.)

THE visitor to Brusa who has climbed the shoulder of Mount Olympus above Chekirge can hardly fail to remember the view which opened to him as he ascended. To the west stretches the long vista of the great plain, with its two bright lakes gleaming far off in the sunshine. It is

bounded on the north by low bare hills, over which shows the wide expanse of the Marmara. To the south the hills are higher, and rise abruptly from the flat. They roll away inland as far as the eye can follow, one billowy sea of ridges green with underwood, and crested with pine forest. Only here and there does some mountain pinnacle tower aloft to arrest attention. One deeper, larger furrow may be traced through the middle distance; it is the rift of the Rhyndacus.

Not many travellers care to explore more closely the country they have thus surveyed. A journey into the hills is indeed a toilsome undertaking. But a tour round the lakes may be made in such luxury as the vehicles of Brusa and the local khans can afford, and will touch many points of picturesque and historical interest.

Two roads lead westwards from Brusa. The one, a regular *chaussée* with bridges, kilometre posts, and telegraph, runs about due west through the plain, and passes along the north shore of the lake of Apollonia to Ulubad and Mihalich. The other is not a metalled road, but is quite practicable for wheals, at least in dry weather. It forks from the highway a few miles out of Brusa, bears gradually away to the left, and skirts the southern shore of the lake to Kassaba Kirmasti. East of the lake the plain is very level for its length, although broken by slight undulations of a hundred feet or two. The flattest section is about the village of Podara, where it may be 6 or 7 miles broad. Villages are rare on the low ground, but fringe the skirts of the hills on both sides. The northern range is perhaps 1000 feet high, the southern about 2000. The former is brown with burnt grass, the latter green with underwood and forest. There is little water in autumn, but the frequent beds show that it must come down from every side in winter and spring. The plain is well cultivated with corn and maize, and thickly dotted with trees, mostly squat bulbous oaks. Towards the southern hills there are also vineyards, and mulberries for the culture of the famous silks of Brusa.

It is about 15 miles from Brusa to the lake of Apollonia, and the lake itself must be nearly 15 miles long from east to west, with a breadth of about half its length at the widest part. There is a strong contrast between the two sides. The northern shore is bare and featureless. The hills rise gently, and present no striking outlines. Their slopes, exposed to the blazing noon, are burnt to a dusty drab colour. There is no shade, and the only verdure (in August) is the belt of turf between the winter and the summer levels of the water. The corn-stubble by the roadside tells of the cultivation, but the only building between Iksia and Ulubad is an empty caravanserai. Issiz Khan, a prominent object from many miles off on the desolate shore. The khan is massively built in the old Turkish style, and its frowning blank walls and dark cavernous portal suggest rather a robber's fortress than a hospitable shelter. Two interests solace the wayfarer on this

dreary road—first, the fine views over the lake, with its many islands and mountainous background; and, second, the teeming birds that haunt the water's edge. The shore is alive with waterfowl—ducks, herons, curlews, and others; immense flocks of white geese congregate on the water; the bushes are full of pigeons and magpies; and half a mile of swallows may be seen at a stretch on the telegraph-wires.

The southern shore of the lake is bolder. Here the steep hillsides scarcely leave room for the road, and when the water is high there must be some difficulty in passing. The shady slopes are clothed with trees and grass, and the road fringed with luxuriant vegetation of figs, vines, hays, clematis, and other plants. A gigantic plane tree near the east end of the lake deserves special mention. We estimated its girth at 40 feet.

The north-eastern part of the lake is dotted with rugged islands, the larger of which support a growth of stunted pines. The easternmost of the group, which in the dry season becomes a peninsula, is joined by a long wooden bridge to a rocky tongue of land projecting from the north shore. It is occupied by the town of Apollonia, one of the most ancient, most picturesque, and dirtiest towns in this part of Anatolia. Approaching from the north along the promontory, one comes first to the ancient cemetery, which lies along both sides of the road. At the southern end of the necropolis the promontory narrows to an isthmus, and at this point, at the corner on the west side, stands the famous temple in the lake. The water was so low at the time of our visit that we were able to ride out to it on dry land. Of the temple itself few traces are now visible, but the massive walls of its island *temenos* are still standing. Beyond the isthmus rises a conical hill, the rocky slopes of which are relieved by a sprinkling of cypresses. Beyond the hill lies the island of Apollonia, almost circular in shape, and rising gently to the centre. The town, which entirely covers the island, is built in narrow tortuous lanes with high overhanging houses. One enters through a gate in the old walls, of which there are considerable portions still standing on the landward side. Into one of the towers is built a course of blocks from an architrave decorated with *bucrania*, and inscribed with the names and titles of the Emperor Hadrian, by whose munificence was erected the portico or other building to which it belonged.* Inside the walls the houses rise steeply one above another up the hill. They are roofed with tiles, and the projecting upper stories are built of wood plastered with mud. The streets are too narrow and too slippery and ill paved for vehicles. There is no room for gardens or trees, but many of the houses have open courtyards. The total number of houses in the town is reckoned at five hundred, and the population is, as it always has been, mainly Greek.

* For details as to the topography and monuments of Apollonia the reader may be referred to the plans, drawings, and descriptions in the sumptuous works of L. B. de La Baze ('Voyage archéologique') and G. Perrot ('La Galatie,' etc.).

One of the most picturesque scenes in this picturesque place is the fish-market held on the beach to the west of the town. The boats, pointed at stem and stern, and fitted with very short masts and very long sprits, are drawn up in a line on the strand, and form a suitable background to the many-coloured crowd. Near the shore they are punted with poles, for the water is so shallow that a man can wade only breast-high in it several hundred yards from the land. The staple of the fishery is the crayfish, of which large quantities are exported to Brusa and even to Constantinople. Numismatists* have been at a loss to explain the appearance, on the coins of a city so far inland as Apollonia, of the maritime emblems of a "lobster" and an anchor. We now see that the "lobster" is really a crayfish, and if the lake be not sufficient explanation of the anchor, then Apollonia may be reckoned a maritime port, for the Rhyndacus is navigable for small vessels right down to the sea.

It was doubtless to this waterway from the sea that Apollonia owed its first foundation as a Greek city. A site so favourable for commerce and for defence, secure from attacks by the land forces of the barbarians, in the heart of a rich plain, with a productive fishery and abundance of timber, at the end of a natural ship-canal, could not fail to attract Greek settlers. Of the history of Apollonia we know very little. The coinage† begins as early as the middle of the fifth century B.C. The patron deity of the town was of course Apollo. He appears on some of the coins in his character of slayer of the python, and it is doubtless no mere accident that the patron saint of modern Apollonia is St. George. From the coins, also, we gather that the chief magistrates bore the title *Strategoi*. Apollonia was included, perhaps by Sulla,‡ in the Roman province of Asia in the *conventus* of Adramyttium,§ but was afterwards transferred to Bithynia.¶ Plutarch records that when Lucullus overtook and annihilated Mithridates' baggage train on the Rhyndacus, the women of Apollonia sallied forth and gathered up the spoil.¶ The city, like many of her neighbours, benefited by the favour of Hadrian, to whom Mysia seems to have been specially endeared by memories of the chaos. The inscription in the walls has been already mentioned, and if we may trust a native as to the *provenance* of another, of which he afterwards communicated a copy in Brusa, Hadrian earned from

* See J. Six, 'De Gorgone,' pp. 39, 40.

† See Reul, 'Hist. Num.'; and the Brit. Mus. Cat.: "Mysia."

‡ See Mommsen's suggestion quoted by Ramsay in his 'Cities and Bishoprics of Phrygia,' I., "The Lycos Valley," p. 203.

§ Phil., V. 2; Pliny, 'N. H.,' V. 123. If Adramyttium seems distant, we must remember that Cyzicus, the natural assign-town for Apollonia, was at first a free state. There is evidence that Cyzicus afterwards became the judicial centre (Aristides, vol. I., Dindorf's Edition, p. 544).

¶ See the ecclesiastical lists.

¶ Phil., 'Lucull.,' II.

the Apolloniates the titles of Preserver and Founder.* In later times Apollonia became a bishopric of Bithynia. It bears the name Theotokia in the lists of the Councils of 680 and 692. Anna Comnena† describes how the Turkish chieftain Elehan was besieged in Apollonia by Alexander Euphorbenus. The town was recovered, but not secured. Some years later it seems to have fallen again into the hands of the Turks,‡ and doubtless continued to suffer from their incursions until it finally passed under their sway.

Apollonia is full of relics of antiquity. Every second house has its "ancient stone," either built into the wall or put to some base purpose, and numerous coins and gems are offered for sale. At two of the villages in the plain also we found inscriptions. Those at Akchele, near the east end of the lake, have some topographical interest. The one‡ reads *Ὀπὸς Μάρκου καὶ Ταυρίων*; the other is also a boundary stone, but has not yet been interpreted. Mandrus is given by Hierocles|| as the name of a place in Hellespontus. Gannatenus might be either a village or a man. The two names together remind one of Pliny's Mandacandeni,¶ Hierocles' Mandacanda.** Probably both were common Mysian words. At Tachtali, under the southern hills, about halfway between Apollonia and Brusa—a village of denationalized Greeks who speak nothing but Turkish—there are considerable remains. A ruined castle overhangs the village, and in one of the streets are some massive foundations, built of enormous blocks quite 10 feet long. A few inscriptions may be seen in the church of St. Theodore, and in the floor of the baths is a marble slab, the tombstone of a bishop John, "a faithful servant of God."

West of the lake of Apollonia stretches an immense flat plain away to the low hills which shut off the lake of Manias beyond the Kara Su (Strabo's Tarsius?, Pliny's Horisius?). The plain is intersected by the three great rivers, the Kara Su issuing from the lake of Manias, the Rhyndacus from the lake of Apollonia, and the Maeæstus flowing between them, so that, except in the dry season, much of it is under water. There is little cultivation, but large herds of buffalo and other cattle graze over the coarse rank grass. The rivers lie low between their mud-banks, and nothing breaks the level monotony of the view.

It is at Kasaba Kirmasti, or Kirmastli, about 10 miles above the lake of Apollonia, that the Rhyndacus bursts through the last barrier of the hills. The town is finely placed on both sides of the river in the gap in the ridge between two plains. The hill on the right bank is

* The inscription in the walls may be read in Hamilton, 'Hemarchia,' No. 204, or Le Bas and Waddington, No. 1065. The other runs as follows: *Ἀγροῦ τῶν Ἀλεξάνδρου* [*Ἀλεξάνδρου* Ἀδριανῶ [*Ὀλῶ*]] *καὶ αὐτῶν καὶ κτίστην.*

† 'Alex.' VI. 13.

‡ Le Bas and Wadd., No. 1065.

¶ 'N. H.' V. 123.

‡ Anna Comnena, 'Alex.' XIV. 5.

|| 664. 1.

** 663. 12.

the higher and steeper, and seems to have been a fortified *acropolis*. It is crowned by a mosque, apparently once a church, in which are two fine Byzantine windows. There are one or two inscriptions in the town, but they may have been carried. Altogether the remains at Kirmasti are not sufficient to indicate an ancient settlement of importance, although there was probably a castle. The old town of the neighbourhood is to be sought at Melde, about 3 miles to the north-west, where there are ruined baths, fountains, and other *débris* of an ancient site. The name to be assigned to it is not easy to decide. The suggestion of Hiera Germa depends simply on the similarity of the names



APOLLONIA.

Germa and Kirmas-II. The hills to the south of Manias also bear the name Kirmas Dagh. The Byzantine castle Aorata,* which Mr. Ramsay placed near Kirmasti,† must, I think, have lain farther to the west or south. Miletopolia is perhaps a possible suggestion, but the balance of evidence seems to put it at Mikhalich.‡

The Rhyndacus at Kirmasti is a turbid rapid stream, spanned by a wooden bridge 140 yards long. But it is not impassable above the lake, for we forded it without difficulty near Glaur-Keni, a village in the marshes, surrounded by plantations of maize and thick tangled vegetation. The river, therefore, is no insuperable obstacle in dry weather; but the road westwards along the southern shore of the lake

* Anna Comnena, 'Alex.,' XIV. 5. See below, Part II.

† 'Historical Geography,' p. 155, note. But Mr. Ramsay writes that he has now abandoned the suggestion.

‡ See below, p. 157.

could be easily blocked, e.g. at the point where the Turks have established the guard-house of Chorach. Hence the importance of the Byzantine fortress at Lopadium, the modern Ulubad, which commanded the bridge on the northern road just below the lake.* The Rhyndacus below the lake is a deep navigable river, and the central section of the modern wooden bridge at Ulubad is made to run to and fro upon rails so as to admit of the passage of masted vessels plying between the lake and the sea. The ancient bridge was of stone. Two or three of its piers still encumber the stream, and several broken-backed arches totter down the banks. The low masts of the Apolloniate fishing-boats are probably traditional from the days of this old bridge.

Ulubad is on the left bank of the Rhyndacus. The older part of the town lies entirely within the walls of the fortress; but since the war of 1878 a large Circassian suburb has been built outside them. The walls are now in a very fragmentary and ruinous condition, and serve only for a nesting-place for the innumerable storks. There are several pre-Roman inscriptions in the town, derived apparently from the Byzantine church, which has been recently rebuilt. Dr. Cichorius,† who has published the most important, very plausibly argues that they must have been brought from Cyzicus.

Miletopolis, the town of the Miles, must be placed near Ulubad, for it was in the late Byzantine period combined in one bishopric with Lopadium.‡ Fimbria's operations against the young Mithridates and his colleagues in the year 85 B.C.,§ prove that Miletopolis was situated near the left bank of the Rhyndacus. These facts confirm the commonly accepted identification of Miletopolis with Mikhalich, which seems to have been first suggested merely by the supposed similarity of the names.|| Strabo¶ does indeed assert that Miletopolis was situated

* Cp. Dumas, 'Hist. Byz.', XXV. P. 93, C.D. Mr. Ramsay has inferred from Zosimus, I. 23, that the bridge was built later than the year 258. See 'Hist. Geogr.', p. 160. The fortress was restored by John Comnenus (Jo. Comnenus, II. 5; Nic. Choni., P. 14 B. 24 D.)

† 'Sitzungsber. der Berl. Akad.', 1889, p. 367.

‡ See Ramsay, 'Hist. Geogr.', p. 159. Mr. Ramsay's correction Μ[ι]λατόν[ι]α for the corrupt Μίλας of Hierocles (ibid., p. 153, note) was in itself quite convincing, but receives additional confirmation from an inscription ('Ath. Mith.', 1889, p. 248), in which the abbreviated form Μίλας, with a small ε over the M, is used. Wesseling declined to hazard the identification. This inscription is not quite correctly given by Dr. Cichorius. It appears to be a boundary-stone between the territories of Pannanenum and Miletopolis, both very wide districts, and has very likely been carried. It does not by itself prove that Miletopolis was at Mikhalich.

§ See M. Théodore Reinach's 'Mithridate Eupator,' p. 201, and the authorities there quoted, especially Orosius, VI. 2.

|| The similarity (if it exists) appears to be accidental. Mikhalich is simply "S. Michael's," and occurs elsewhere in Anatolia. See Ramsay, 'The Cities and Bishoprics of Phrygia,' vol. I., "The Lycae Valley," p. 31.

¶ Strabo, 573. On the difficulty as to the three lakes, see M. G. Petrot's lucid discussion in his 'Galatie et Bithynie.' One might, I think, conjecture an ancient lake

on or near the great lake called after the town (which can be none other than the lake of Manias, for he expressly distinguishes it from the lake of Apollonia), and Mikhalich, distant only about 5 miles from the lake of Apollonia, is quite 15 miles from the lake of Manias. But it is evident from Strabo's account of the geography of Mysia, and especially from his various mentions of the three lakes and their rivers, that he had no personal or accurate knowledge of the district. Strabo must be interpreted by the geography rather than the geography by Strabo. His statement as to the position of Miletopolis is probably a mere inference from the name of the lake. The further objection, that the lake could not have acquired the name Miletopolitis if Miletopolis had been so far off as Mikhalich, has been much weakened by Mr. Ramsay's ingenious demonstration that the Milatæ occupied the whole district to the south and east as far as Hadrianotheræ.* In fact, the only alternative site that could reasonably be suggested for Miletopolis would be Melde, near Kirmasti; † and although it might be easier for Fimbria to ford (if he did *ford*) the Rhyndacus there, yet the southern road is a very much less probable route for an army than the Mikhalich road, and Kirmasti is 5 miles farther than Mikhalich from the lake of Manias. Everything, therefore, points to Mikhalich as the site of Miletopolis.

Mikhalich lies about 4 miles from Ulubad, on an isolated ridge between the Rhyndacus and the Macestus, just where the three rivers draw together to their confluence at the head of the valley which leads them down to the sea.‡ The ridge is of no great elevation, but considerable breadth, and slopes steeply on both sides. The town is large, and has several big mosques and something of a bazar. An enterprising Englishman has even set up a steam-mill! We were told that the place has been much improved by a large settlement of refugees from Rumelia, who have introduced a new water-supply and other European luxuries. There are a few inscriptions, mostly of very late date.

The road to Panderma crosses the Macestus and the Kara Su immediately after leaving Mikhalich, and keeps along the roots of the hills to the north first of the latter river and then of a tributary stream, until beyond Omar Keni it crosses a bleak upland, and drops abruptly down to the sea. But we found it possible to take a "dry weather track" which runs from the Macestus bridge through the marshy flat to a ford on the Kara Su near Top Hissar, and strikes the high-road a mile beyond

in the marshy valley of the Kara Su from Mikhalich to Kadi Keni; but such a lake, although it might possibly claim the name of Dercyllis, could not displace the title Miletopolitis with the lake of Manias.

* 'Hist. Geogr.' p. 156. This would mean the whole lower Macestus valley, with the plains that open on to it.

† See p. 153.

‡ Cp. Leon. Chalc., V. P. 120 C., where Mikhalich is already (in the fifteenth century) called by its present name. Chaleceonstynas, if the text is to be trusted, seems to take *Lopadium* for the name of the lake of Apollonia.

Kadi Keui. At a farm near the ford there are a few fragments from a Byzantine church. The ford is commanded by the castle of Top Hisar, which stands above the village on a rocky spur of the hills between the Kara Su and the lake of Manias.

At Yenije Keui, a poverty-stricken village of Rumelian refugees, a mile or so to the right of the high-road, we found several carved stones. Most of them are bits of tombstones of the ordinary "funeral feast" type, but one is of unusual interest. It is a marble slab with a sculptured relief of three horsemen in Oriental garb galloping over two corpses. The style and types resemble those of the Lycian reliefs, although the workmanship appears to be comparatively late.

From Yenije Keui a horse-path runs over hill and dale to Omar Keui. Bare slopes alternate with copses of low brushwood, and the country has an open rolling aspect. From a rise between Yenije Keui and Tachteladobasi one gets a glimpse of lake Manias. In the graveyard at Omar Keui we copied a Roman milestone,* which bears the number VIII. The distance from Cyzicus to Omar Keui must be something like 10 miles, so the stone must have been carried. The mountain mass of the Kapu Dag (Dindymon) behind Cyzicus shuts out the Marmara, and the bay is not visible until one reaches the edge of the steep descent into Panderna.

Panderna retains the name of Panormus, the eastern port of Cyzicus (Steph. Byz., s.v., Schol. Apoll. Rhod., I. 954). It is a flourishing Greek *scala*, with a steamer to Constantinople three times a week. The western port of Cyzicus is now represented by Erdek ('Apráκη), at the south-west corner of the peninsula. The harbour is perhaps to be identified with the Chytus of Apollonius Rhodius (I. 987). At least, the islet and rocks across the mouth of the bay suit the story of the giants. Erdek is the seat of an archbishopric, and boasts a large but ugly modern cathedral. On the islet in front of the town † there are vestiges of building, and the promontory to the south (Melanos) has been enclosed by high walls. The site of Cyzicus, known to the Turks as Balkus (Παλαία Κίχκος?), has been for so many centuries a quarry for building-stone that little is now standing above ground. The level ground is one big garden of vines and fruit-trees—olives, walnuts, peaches, and cherries. The bay tree grows wild in such profusion that the air is scented with its perfume. Inscribed or carved stones, plundered from the site, are to be found in most of the neighbouring villages. At Edinjik especially there are many inscriptions, and the wooden columns which support the upper chambers over the public "exchange" rest upon inverted marble capitals. The well in the portico below is worth mention for its beautiful cupola of wrought iron. Edinjik lies on the edge of the plateau which falls in a steep olive-clad slope to the gulf of

* See p. 163.

† Cf. Strabo, 576.

Erdek. It is the principal Turkish town of the neighbourhood, and wears a fairly prosperous aspect. There is a small bazar, and a large market square crowded with bullock-carts.

The country to the south is undulating and open. It sinks gradually in decreasing waves towards the lake of Manias. In the autumn it looks bare and parched, but the corn-stubble tells of more cultivation than appears on a distant view. At Chepne, or Shelma, there are a few Byzantine inscriptions, one of which appears to be a boundary-stone. The shores of lake Manias are dismally flat, and the water has an ugly dirty colour. Indeed, in every point this lake contrasts most unfavourably with its sister of Apollonia. The hills lack character, and stand too far back from the basin of the lake to present any picturesque combinations. There is some good grass land along the south-west margin, but a painful deficiency of timber. The plain to the south-east is, however, rather better stocked with trees, and the Kirmas Dagh, although too remote to relieve the bareness, is well wooded. On the western shore are two interesting colonies, which preserve amid alien surroundings the traditions of far distant homes. The one is the Bulgar village of Ismula, on a low spit projecting into the lake; the other, the Russian settlement of Kazak Keni, on the verge of the grass country. The Russians, although by their own account they have been settled at Kazak Keni for centuries, retain their national type and customs with surprising freshness. They are a large-built race, with fair hair and blue eyes. Their dress is a white tunic, embroidered with red, and blue breeches. Their houses are neat and well kept, with whitewashed walls and a wooden portico in front, the floor and sides of which, up to 3 feet from the ground, are painted black. Each house is surrounded by its own hedge. The inhabitants appear to be prosperous and contented.

The whole district between the lake and the Kirmas Dagh is known as Manias, but two of its numerous villages also bear the name. The one* lies 2 or 3 miles to the east of the Kara Su, on the first swell of the hills. It is a small new village, the seat of the mudir of the district. The other, which is distinguished as Eski Manias (Old Manias), is a couple of hours to the south-east, at the mouth of a ravine close under the Manias Dagh, one of the highest summits of the Kirmas range. The eastern side of the ravine is formed by a precipitous spur of the Manias Dagh, joined to the main mass only by a narrow neck. The whole of the hilltop has been enclosed with walls, and the ascent from the neck especially has been strongly fortified. On this the only accessible side a good deal of the walls is still standing. In them are embedded a large number of marble blocks, many of them square bases, stuck end on into the masonry. A curious decorative effect is given

* I fancy Kiepert's Kulak must be identical with this village, although the situation scarcely corresponds, and we never heard the name Kulak mentioned there.

by a course of small marble columns similarly immured, the ends showing as a string of white circles. Although at this point there is a regular castle to guard the approach, the top of the hill, which is of considerable extent, is bare save for a slight mound in the middle. The isthmus, on the other hand, has at some time been built over. It is strewn with small stones, and a mosque, partly constructed of marble blocks, with a pretty red brick minaret, is still standing, roofless and desolate. On the shoulder of the mountain behind there is a large Turkish tomb and other buildings, also in a dilapidated condition. Many of the marble blocks are no doubt inscribed, but few of the inscriptions are exposed. Of these the most important is an honorary decree dating from the first century a.c., probably from the year 42 a.c. It has been published (from a very imperfect copy) by M. A. S. Dörigny in the *Revue Archéologique*, vol. xxxiv. p. 106.

In this interesting cluster of ruins we have evidently a Byzantine fortress, built partly of marbles from an important Greek city, and itself in turn furnishing materials for an early Turkish settlement. Where was the original Greek city? M. Dörigny accepts without hesitation Hamilton's suggestion that the ruins mark the site of *Pemaneum*. But *Pemaneum* must have lain to the west or south-west of the lake. Moreover, the number of the marbles and the character of the inscriptions, especially the honorary decree in the name of the communities and associations in Asia in alliance with the Romans, indicate a city of importance, and it is difficult to see, first, how the narrow hilltop could have supported a considerable town, and, secondly, how such a town could have left no more substantial traces of its existence. The hilltop, therefore, can hardly be the original Greek city, but the marbles must have been brought from elsewhere. I believe that they were brought, like those at Ulubad, from Cyzicus. For it would be difficult to name any other city within reach which both attained to sufficient importance at so early a date as the inscriptions demand, and was also sufficiently decayed to be pillaged for building-stone by the time the Byzantine fortress was erected. And if Cyzicus seems a long way off, it must be remembered that there is a waterway from it to within 10 miles of Eski Manias up the Macestus, perhaps also by way of the Kara Su and lake.

I regard, therefore, the buildings on the hilltop as no older than the Byzantine fortress. The fortress is admirably placed to command both the road westwards between the lake and the hills, and the road southwards up the Macestus valley, and to dominate the whole plain between the Kara Su and the Macestus. It must have been one of the most important in that ring of strongholds with which the Byzantine emperors encircled the great plains, the regular mustering-ground of their forces and base of their operations in their Turkish wars. Can we, then, identify it with any of the fortresses famous in the history of those campaigns? I would suggest Lentianna. Lentianna was not far from

Pömanenum, for the former is seldom mentioned without reference to the latter.* We may infer, from the order in which Georgius Acropolita mentions a series of places which fell into the hands of the Latins, that it lay east of Pömanenum and west of Lopadium—Βάρης τε καὶ Ἀδελφείας Ποιμανηρίου τε καὶ Λατινὰ μέχρι τοῦ Λοπαδίου αὐτοῖς.† This inference is confirmed by Anna Comnena's account‡ of the movements of the Turks on their invasion of Mysia in the year 1113. Having ravaged the country to the east, they proceed to plunder the district about Lopadium, and incidentally capture Cyzicus by an attack from the side of the sea. They then divide their forces, and while one division crosses



TURK TENTS NEAR CHOBANLAR.

the Barenus (probably the Granicus), and follows the coast road to Adramyttium and Chliara, the other marches through Lentiana towards Pömanenum. I take it that the surprise of Cyzicus was a separate episode; the Turks divided near Lopadium, and Lentiana lay on the way from Lopadium to Pömanenum. The one division, therefore, passed to the north of the lake of Manias, the other to the south. In support of this interpretation may be quoted another passage of Anna.§ A Turkish band was ravaging κατὰ τὴν περὶ τοὺς πρόποδας τοῦ Λατινίου καὶ τῆς νῦν καλούμενης Κοτοραικίας διακεκμηγῆς ἐπιδαΐδας, evidently a plain at the foot of a range of hills. The emperor, advancing from the east,

* See Anna Comn., 'Alex.,' XIV. 3, XV. 1; Georg. Acrop., 6, 10, and 22.

† Georg. Acrop., 6.

‡ 'Alex.,' XIV. 3.

§ 'Alex.,' XV. 1.

encamped just short of the bridge at Lopadium, *κατὰ τὴν βρῖσιν τοῦ καρυκῆος ἐκλουμένην*, probably beside the spring by the roadside at the north-west corner of the lake, between Issiz Khan and Ulubad. The Turks, in order to give a false impression of their number, lit many fires. The foot-hills of Lentiana must therefore have been visible from Lopadium. The emperor next day pushed forward to the scene of the pillage, but the Turks had already made off with their booty. He accordingly encamped near Pormanenum, obviously not far distant, and sent a light corps in pursuit.

These descriptions fit in very well with the situation of Eski Manias, and what few details we are told about the siege of Lentiana by Henry in A.D. 1214,* harmonize with the topography of the site. The general direction of Pormanenum, on which our suggested identification partly depends, cannot be doubted by any one who has examined the evidence.†

From New Manias a horse-track leads through the forests of the Kirmas Dagħ to Shamli, and thence on to Balukiser. But the country to the south belongs to the following section. We have done with the plains and the lakes.

II. THE MACESTUS VALLEY AND THE ROAD CONNECTED WITH IT.

(By J. A. R. Munro.)

The Macestus may be said to have its source in the lake of Simav, although a small stream flows into the lake at the one end, while the Macestus flows out at the other. The Turkish name for the river is the Simav Chai down to Susurlu, where it issues from the hills. Few rivers of its length have so narrow a basin. The Macestus flows throughout the greater part of its course in a deep valley hemmed by mountains, a mere channel in the hills. Nowhere, except at the plain of Balukiser and Kebesud, does it receive any considerable tributaries; nowhere else, above Susurlu, do the walls that close it in sink into mere undulations. Yet the Macestus valley, although narrowly hedged, is an easy route, far easier than the main course of the Rhyndacons. It is traversed by a road almost from end to end. Only two parts present any difficulty—the gorge above Bigadiç, where the road cuts off the corner between Sinjerli and that town; and a narrow ravine a little above Susurlu, where the traveller to Balukiser leaves the river and bears away to the south-west.

The lower valley of the Macestus has always been an important highway. At the present day a well-kept *chaussée* runs from Panderna

* Georg. Acrop., 16. The defenders suffered from lack of water. There is water behind and below the castle of Eski Manias, but none on the hill itself. When the engines of the besiegers made a breach in the walls, the gap was defended by a big bonfire for forty days. The engines could be brought to bear on the southern wall, and to this day the other slopes, especially the eastern, are thickly wooded with coppice.

† See the next section.

through Susurlu, and over the easy pass of Demir Kapu to Balukiser. Along it passes the whole traffic from Bigadieh and from the great plain of Balukiser, and the transport service of the English and French borax mines near Sultan Chair. It is even proposed to extend the Soma branch of the Smyrna and Kassaba railway by this route to the north coast.

The two mines lie close together to the east of the *chaussée*, in a broad open valley traversed by a little tributary of the Macestus, between the mouth of the narrow ravine and the Demir Kapu pass. A concession for a third mine has recently been granted to a Turkish pasha. The workmen are mostly Circassians from the village of Demir Kapu or Chinarli. Fuel for the machinery is supplied from the forests of the Chatalja Dagh, which dominates this part of the Macestus valley on the east. The boracite is sent down to Panderma for shipment in bullock-carts or on the backs of camels.

Balukiser lies at the north-west corner of the large plain which opens from the left bank of the Macestus to the south of the hill country of the Kirmas Dagh. The plain is fertile and well cultivated. It is said to support no less than thirty villages. Although streams are numerous, drinking-water has to be brought to Balukiser from a source at a considerable distance to the west. The town is the most important in this part of the interior. It has a large bazar, and the principal mosque is a very fine old Turkish building. The name Balikesri, by which Balukiser is commonly designated on the maps, does not seem to be in general use among the peasantry of the district. We never heard it after leaving Brusa.

In ancient times the lower Macestus road was even more important. Cyzicus was justly held to be a "door of Asia." * Two roads led southwards from Cyzicus to Pergamus. The one passed to the west of lake Manias by Pemanenum; the other, with which we are here concerned, ran eastwards as far as Miletopolis, where it was joined by the highway from Nicæa and Constantinople, and then turned up the Macestus valley. Of this road some traces remain. The milestone at Omar Keui near Panderma has been already mentioned. A very similar inscription, with the same imperial names, on a milestone at Debleki, some miles to the south of Omar Keui, has been published by MM. Leclat and Radet.† Unfortunately, the number of miles is lacking. Another miliary inscription, probably from the same road, is to be found in M. Perrot's 'Galatie et Bithynie,' No. 62, p. 96. This milestone was discovered at Chamaudra, on the left bank of the Macestus, three hours above Mikhallieh. It bears the numeral xxv., which M. Perrot reckons is about the right number of miles from Cyzicus.

* Cicero, 'Pro Murena,' 15.

† 'Bulletin de correspondance hellénique,' 1895, p. 524.

Higher up the river, above Sasurlu, but a little below the village of Sultan Chair,* there is a Roman bridge. It is in a ruinous condition, but must have had ten or twelve arches. The middle portion, which encumbered the channel, was blown up by the original French lessee of the borax-mines, who hoped to make the river navigable for the transport of the mineral. As there is no need for the road to cross the Macestus, this bridge perhaps indicates a branch from Kirmasti. A Byzantine fort on a little hill overhanging the road between the bridge and the village of Sultan Chair was obviously intended to guard the passage.

It is just above Sultan Chair that the modern *chaussée* turns away from the Macestus up the tributary stream towards the Demir Kapu pass. Nearly parallel to this valley, a few miles to the west of it, flows a larger stream, the Hatab, which joins the Macestus below Sasurlu. The principal village of the Hatab Dere is Omer Keni, near which there is a tepid spring, and some faint traces of a small Byzantine site. On the low ridge between the two valleys, above Omer Keni, the ancient road may be clearly traced for several miles. It must bear away from the Macestus from a point near the bridge at Sultan Chair, and keep up beside the Hatab, avoiding the Demir Kapu pass. It rejoins the modern road at the head of the Hatab valley, and keeps it company, now on one side, now on the other, right down to the Balukiser plain, where it is lost in the deeper soil of the cultivated land. The roadway is still in some places well preserved, although much of it must have gone into the construction of the *chaussée*, and we saw a gang of labourers busy picking it up to make road-metal. It is paved with small stones carefully fitted and hammered down, and in every respect resembles the great road through Cappadocia to the Euphrates as described by Mr. D. G. Hogarth in 'R.G.S. Supplementary Papers,' vol. iii. We kept a sharp look-out for milestones, and asked after them at every opportunity, but found none. I fancy that just as the milestones on the Cappadocian road begin and end with the district of Cataonia, so also on this road they begin and end with the territory of Cyzicus. Other parallels might be quoted.

The ancient road, then, may be traced southwards as far as the plain of Balukiser. It is in this neighbourhood that Hadrianutheia, the only station noted on the Peutinger Table† between Miletopolis and Pergamus, must be sought, as Mr. Ramsay has rightly seen.‡ The distances given in the table are, it is true, corrupt, but the general position of the town cannot be doubted. The plain of Balukiser is

* Erroneously given on Kiepert's map as Sultanie.

† The table gives the name as Hadrianuteia, which may point to a form Hadrianutem or -teira, and confirm M. S. Reinach's conjecture (quoted by Ramsay, 'Hist. Geogr.' p. 457) that -theia = -teira = "town." Cp. Teira, Thyateira, etc.

‡ 'Hist. Geogr.' pp. 155-157.

marked by nature as an important station and meeting-point of roads. The road from Mikhalich to Edrenid (Adramyttium), the modern equivalent of the road from Miletópolis to Pergamum, passes through Balukiser, which owes much of its prosperity to its central position on the highway of traffic from sea to sea. Hadrianuthera cannot have been far distant from Achyraous, for the two names appear in the later *Notitiæ* as alternative titles, and Achyraous, as I hope to show presently, may be placed at Bigalich. Lastly, Aristides' descriptions of his journeys* seem to indicate the neighbourhood of Balukiser for the site of Hadrianuthera.

The evidence of Aristides, who was a native of the country, is of great importance, and as it concerns both Hadrianuthera and Poemanenum, it seems worth while to enter into it more particularly. We are justified, I think, in assuming that the two roads from Cyzicus to Pergamum, the one passing to the west of Lake Manias and through Poemanenum, the other to the east and through Miletópolis and Hadrianuthera, reached the Caicus valley by the two passes at Ivrindi and Koresen respectively. Aristides had two estates, which lay near to one another, his paternal home close by the temple of Zeus Olympius, apparently to the north of a ridge called the ridge of Atys, and a property at a place, Lauceion, to the south of the ridge.† His way to Pergamum lay through Hadrianuthera, which cannot have been many miles off, for he can hesitate to set out about sunset when the roads are heavy, lest he should not reach Hadrianuthera for the night.‡ To judge from other journeys, it seems to have been his practice to leave home rather late in the day and make a short first stage. His movements were determined by his dreams, and no doubt time was required for packing. Probably Hadrianuthera was his usual halting-place for the first night on his journeys to Pergamum. The total distance to Pergamum was two or three days' march.§ On one occasion Aristides made the following stages: (1) down to "the plain;" (2) to a temple of Apollo "under the hill" (after crossing the top); (3) a long day of 300 stades (37½ miles) to Pergamum.¶ We may suppose that "the plain" is the plain of Balukiser, "the hill" the Uzunja Dagh, and the temple of Apollo lay somewhere near Koresen, to the south of the watershed. Hadrianuthera might lie in the plain, and Aristides' home beyond the high ridge to the north of Balukiser.

How does this position square with other indications? Aristides' home is 440 stades (55 miles) from Cyzicus, and 320 stades (40 miles) from "the lake," doubtless the lake of Manias. On the way there were hot springs. Aristides can set out a little before midday, and, travelling

* *Historia Sacra*. Cp. Ramsay, *loc. cit.*

† Aristides, ed. Dindorf, vol. i. pp. 498, 499, 532.

‡ *Ibid.*, ed. Dindorf, vol. i. p. 498. § *Ibid.*, pp. 390, 397. ¶ *Ibid.*, pp. 528-541.

slowly, reach them late in the afternoon.* He intends to pass the night there, and these springs were probably his usual first halting-place on the way to Cyzicus. It is not clear whether they are the same as the hot springs to which he once makes an excursion and returns the same day,† for the starting-point of this excursion is not given. But the distance, 120 stades (15 miles) mentioned on the latter occasion, is, at all events, a probable estimate for the springs on the road to Cyzicus. There are, so far as I know, only three hot springs which might claim to be those in question: (1) at Ilija Keni, on an affluent of the Kara Su; (2) the tepid spring already noticed at Omer Keni, in the valley of the Hatab; (3) a spring reported to exist near Yildiz, in the Macestus valley, about halfway between Ssaurin and Kobsud. This last situation is put out of court by considerations to be presently brought forward. Either Ilija Keni or Omer Keni are possible, both in relation to Cyzicus and the lake, and in relation to the probable position of Aristides' paternal estate and Pergamus. But the spring at Omer Keni is so insignificant and of so low a temperature that Ilija Keni, a noted hot spring, where Kiepert found ancient remains, seems much the more probable suggestion. I infer, therefore, that Aristides' home lay about 15 miles' march to the south or south-east of Ilija Keni.

Our final test must be Aristides' journey through Pœmanenum to another set of hot springs on the *Ægeus*.‡ The total distance was two days' journey, and Pœmanenum, the intermediate station, was 160 stades (20 miles) from Aristides' home. Now, Pœmanenum, being on the direct western road from Cyzicus to Pergamus,§ cannot lie far east of a line between the western end of Lake Maniav and Ivriindi, practically the line of the valley of the Kara Su. A line drawn parallel to this one, 20 miles farther east, cuts the 15-mile radius from Ilija Keni a few miles north or north-east of Balukiser, about Utchhunar on Kiepert's large map, but the road (as distinguished from the air) lines would meet several miles to the north-west of this point. These measurements preclude us from setting Aristides' home to the east of the Miletopolis road. Neither can we set it far to the west; for in that case Aristides must have preferred the western road to Pergamus, and not passed through Hadrianotherie and the plain of Balukiser. Moreover, it would be difficult to extend the Milasian territory, in which, according to Mr. Ramsay's convincing emendation of Cedrenus, Hadrianotherie was included, west of the Macestus basin. Our evidence, therefore, seems to indicate that Aristides' paternal estate near the temple of Zens was a few miles to the north or north-

* Aristides, p. 337.

† Ibid., pp. 489-490.

‡ Ibid., pp. 562-563.

§ The Phenomeno of the table appears to be certainly Pœmanenum.

|| Cedrenus, p. 249 B. (Adparabē) de Mōriē tēpōtas φεσδδμηνος τήλας, καὶ περὶ τῶν αὐτῶν αὐτῆς Ἀδριανῶν τήλας de τοῖς περὶ τῶν. Ramsay, 'Hist. Geogr.' p. 150, reads de τοῖς Μιλιανῶν.

west of Balukiser, perhaps on the road to Shamli or the road to Ilija Keui. Hadrianotheræ must have lain to the south or south-east of it in the Balukiser plain. Our visit to Balukiser was hurried, and the local authorities were suspicious and obstructive, but we failed to find any ancient remains there, or hear of any in the neighbourhood. The name of Chair Hissar, one of the villages to the south, suggests a site, and probably Hadrianotheræ lay in that direction. Keband, at the north-east corner of the plain, beyond the Macestus, is too far to the east, although inscriptions and remains of buildings indicate an ancient town there.

The situation of Aristides' home, thus fixed within narrow limits, throws some light on the position of Pemanenum, which lay 20 miles from it, and must therefore be sought in or near the valley of the Kara Su. Could we determine the hot springs for which Aristides was making when he passed through Pemanenum, there would be little difficulty. Unfortunately, there are two sets of hot springs on the *Æsepus*: (1) near Gunen, on the lower course of the river, about west of the lake of Manias; (2) near Khydyrlar, not far from the headwaters.* Both might be described as two days' journey from Aristides' estate, although I think the description more appropriate to the second. If Aristides was on his way to Gunen,† Pemanenum would fall about 5 miles north-west of Ilija Keui, in the valley of the Kara Su. If he was making for Khydyrlar, Pemanenum must lie about 10 miles higher up the valley, in the neighbourhood of Balia. Mr. Ramsay prefers the former alternative, and seems to assume that Aristides' road to Pemanenum coincided with his road to Cyzicus.‡ I see no reason for this assumption, but several against it. Aristides does not mention Pemanenum on his journey to Cyzicus. He was belated and could not find room at the hot springs (of Ilija Keui). Surely, if Pemanenum had been on his road, he would have stopped there, instead of pushing on to the lake. Similarly, he does not mention the hot springs on his journey to Pemanenum, although he was belated again, and would naturally have stopped at them, instead of pushing on in the dark to Pemanenum. I fancy Mr. Ramsay must have been misled as to the distances by road from Pergamum, and, having first measured the 65 miles given in the Table along too straight a line, and so put Pemanenum too far north, he has then inferred that it must lie on

* In the modern department of Avunia, the name of which suggests an echo of the ancient *Atavunia*.

† Lolling has published an inscription from Gunen, in which the word [*ἡδύχαι*] may be restored ('*Ath. Mitth.*' 1881, p. 35); but even if the restoration is accepted, it only shows, as Mr. Ramsay points out, that the territory of Pemanenum extended to Gunen, not that Pemanenum itself was situated there, as Kiepert has inferred in the notes to his latest map.

‡ '*Hist. Geogr.*,' pp. 157, 159, 160, 438.

Aristides' way to Cyzicus; next inferred its distance from Cyzicus by subtracting Aristides' stades to Pœmanenum from his stades to Cyzicus ($440 - 160 = 280 = 35$ miles); and finally, finding his road-line of 100 miles too short for the air-line of 95 miles, conjecturally inserted south of Pœmanenum the 10 additional miles which really lie between it and Cyzicus.

But the road measurements rather support the alternative view that Aristides' destination was the hot springs at Khydyrlar, and Pœmanenum lay near Balia. The Table gives the road from Pergamus to Cyzicus as—

“Pergamo xxxv Argesis xxx Phœmenio . . . Cyzico.”

The number between Pœmanenum and Cyzicus is lost. I do not enter into the question of Argesis, but provisionally accept the total 65 miles to Pœmanenum. Ivrindi is reckoned fifteen and a half hours from Pergamus*—say 48 miles—and the silver-mines of Balia must be quite 13 miles from Ivrindi. Now, about 4 miles north of Balia, at the confluence of the Kara Su and a tributary stream, Kiepert marks a group of ruins, which I take to be identical with the imposing castle of Balia mentioned by Dorigny.† The town of Pœmanenum may have lain near the mines, which were worked in antiquity, and the famous fortress a little to the north. The distances to Pergamus and to Balukisar square well enough with the Table and with Aristides, and the missing number of miles to Cyzicus may just as well have been xlv. as xxxv.

Other considerations support the identification here suggested. It would be quite in Aristides' manner to make a short first stage to Balia, and a long stage of 25 or 30 miles to the springs. The military importance of Pœmanenum marks it as a knot in the system of roads. The roads from Pergamus and from Adramyttium meet near Balia, and I propose now to show that there are indications of another road which must have cut them at this point. It is a road from east to west, which, although not of first-rate importance, has not received the recognition it deserves.

(To be continued.)

NOTE ON THE MAP.—The map is based on Kiepert's Map of Western Asia Minor (1: 250,000), but considerable additions and corrections have been made.

Kiepert's rendering of the environs of Harmanjik is quite irreconcilable with Mr. Munro's description. Perrot's route survey, which Kiepert's draughtsman apparently misunderstood, would put Harmanjik much further south, and so do away with the unnatural approximation of the Rhyndacus and Harmanjik rivers. Mr. Munro was told that to go from Harmanjik to Emed by way of Tavshauli

* See the recently published 'Handbook to Asia Minor,' edited by Sir Charles Wilson, p. 61.

† *Revue archéologique*, vol. xxxiv.

was making a very wide *détour*. This would seem to point to the same conclusion. In the absence of astronomical observations by Mr. Munro, however, Harmanjik has been left where Kiepert puts it, though the topographical details have been altered. The Egriguz Dag on Kiepert's map appears to be placed too far south in relation to Sinakler and Simav. On the present map it is laid down from compass-bearings; the times along the road from Egriguz to Simav, and the evidence of photographs, are also taken into consideration. The confusion in the hydrography of the upper Rhyndacus and the Egriguz Chal on Kiepert's map appears to have been due partly to a misconception as to the course of the latter river below Egriguz, partly to a lithographer's error.—B. V. D.

THE JUBILEE OF THE HAKLUYT SOCIETY.

A MEETING was held in celebration of the Fiftieth Anniversary of the Hakluyt Society, in the Map Room, at 1, Savile Row, W., on Tuesday, December 15, 1896. The chair was taken by the President (Sir Clements Markham, K.C.B., F.R.S.), who delivered the following address:—

We are assembled this evening to celebrate the jubilee of an institution which has been doing steady work for half a century, without much stir, without attracting any large share of attention, but diligently, usefully, and successfully. During fifty years the Hakluyt Society has issued volumes, bearing on their sides that famous ship *Victoria*, which was the first to circumnavigate the globe, and usually containing the texts, the very words of travellers and voyagers in all parts of the world, which were previously inedited, untranslated, or unknown. The Society is called the Hakluyt Society, because it continues the work and strives to fulfil the aspirations of Richard Hakluyt. That great man, like the Society which bears his honoured name, is not so well known to the present generation, which owes so much to his labours, as he ought to be.

Yet his life-story is worth the telling. Born in 1533, as a young lad from Herefordshire, we first hear of him at Westminster School, "that fruitfule nursery," as he called it, where he was for about six years: from 1564 to 1570. It was in the days of the good dean, Dr. Gabriel Goodman, who used to take walks to Chiswick with the boys, and, like his successor, Lancelot Andrewes, took his share of teaching them. In those days learning was assuredly not neglected; and, considering who were Hakluyt's schoolfellows, he might well call Westminster "a fruitfule nursery." Among them were boys who became great scholars and divines, lawyers, bishops, and translators of the Bible, as well as comedians, poets, and celebrated wits. One boy, named Eades, was not only the greatest punster of his time when he grew up, but could repeat upwards of two hundred puns of his friend, Dr. Toby Mathew, as well. So they must have had a lively time at Westminster, if there were more boys like him. The young years of

another of Hakluyt's schoolfellows were passed in poetical fancies and the composing of tragedies.

But with all these attractions, and though he was a diligent scholar, Richard Hakluyt seems to have loved to pay visits which must have been quite out of bounds. One such visit decided the bent of his mind for the rest of his life. It was his hap, he tells us, to visit his cousin and namesake, who was a gentleman of the Middle Temple. He there found, lying open on his cousin's table, some books on cosmography and a map of the world. The curiosity and interest of the intelligent boy were aroused. His cousin began by giving explanatory answers to his eager questions, and ended with a regular lecture on the divisions of the earth, pointing out the rivers, capes, and bays, and the territorial divisions, with a disquisition on the commodities and requirements of each country. From the map his cousin took him to the Bible, and made him read the 23rd and 24th verses of the 107th Psalm, about "they which go down to the sea in ships, and occupy their business in the great waters."

This geographical discourse made so deep an impression on the boy that he never forgot it. He says that he was then told "things that were of high and rare delight to his young nature;" and he made a resolution, from which he never swerved, that he would continue to study that subject of geography, the doors of which had been so happily opened before him. Such was the result of this Westminster boy's visit to the Middle Temple. In 1570 he left school and became a student at Christ Church, Oxford, where the learned and kindly Dr. John Piers, the future Archbishop of York, was Dean. The study of geography had completely fascinated him. He did not neglect his regular work, and took his degree in due course; but as soon as his time was his own, he devoured every narrative of adventure that he could get hold of, whether printed or in manuscript, and mastered six languages, besides his own, in order to be able to read them.

He soon began to see two great needs of his country, and he set himself to work with patriotic zeal to remedy the evils. The first was caused by the ignorance of our seamen as regards the scientific branch of their profession. The second was the absence of records, and the way in which important voyages and travels were allowed to fall into oblivion. He strove, during a long life, with great ability and untiring perseverance to remedy these evils; and the measure of success he attained justly places his name among those of worthies who have deserved well of their country.

His first public service was the delivery of lectures on the construction and use of maps, spheres, and nautical instruments, as he tells us—"to the singular pleasure and general contentment of his auditory." It has been assumed that these public lectures were delivered at Oxford, but this is exceedingly improbable. Of course the lectures were given

to those who, in Hakluyt's opinion, were in urgent need of them, and to whom they would give "singular pleasure and general contentment:" to the merchants and sailors of the port of London. He never lost sight of the importance of establishing a permanent lectureship "as a means of breeding up skilful seamen and mariners in this realm;" and he constantly urged it on the attention of those in authority, describing the excellent system of instruction established at Seville by the Spanish Government under Zamorano, Chaves, and other eminent cosmographers. But all to little effect. There were some lectures given in Sir Thomas Smith's house by Hood and others, but there was no permanent lectureship in practical astronomy. So things went on in a haphazard way for centuries, and when the present Sir Roger Goldsworthy wanted to learn nautical astronomy twenty years ago, I could only refer him to an old lady in the Minorities, who was an excellent teacher, but who then stood almost alone. Now all has been changed by the Royal Geographical Society; there is a regular system of instruction under Mr. Coles, and most of the best-known travellers and explorers of the last fifteen years were trained by him. The ideal of Richard Hakluyt has thus at length been realized, and Mr. Coles is a man after Hakluyt's own heart.

The other evil which Hakluyt set himself to alleviate was the absence of records of voyages and travels. It is true that his predecessor, Richard Eden, had made a collection, the second edition of which appeared at about the time that Hakluyt left Westminster and went to Oxford. But of all the English voyages that had been undertaken for a century previous to that time, most had been utterly forgotten. Even of the memorable voyages of John Cabot to America there was neither a map nor a scrap of writing. Of the achievements of Columbus, at the same time, there are his letters, his journal, and many other documents; but of Cabot's voyages there is nothing. Hakluyt looked upon this as a great national calamity, as indeed it was. He devoted his life to the application of a remedy.

Hakluyt felt that the preservation of such records was not only a means of keeping in remembrance brave and noble deeds for the emulation of posterity—though this in itself was a good and sufficient reason for his labours—he saw also the great importance of the information thus preserved, to the sailor, the merchant, and the colonist. He set vigorously to work at the preparation of his first book, entitled '*Divers Voyages touching the Discoverie of America*,' when he was quite a young man, and published it in 1582. It became so excessively rare that, until the Hakluyt Society reprinted it in 1892, there were only five copies in existence. Like all his other works, his '*Divers Voyages*' had a direct and practical object. Hakluyt was an ardent advocate of colonization. But the first step must necessarily be the enlightenment of his countrymen by the supply of information. Collecting

it from all available sources, he brought together various accounts showing the history of the discovery of the whole of the east coast of North America. He thus gave his readers the fullest particulars then known, so that his '*Divers Voyages*' was the first impetus to colonization. Virtually, Raleigh and Hakluyt were the founders of those colonies which eventually formed the United States. Americans revere the name of Walter Raleigh; they should give an equal place to that of Richard Hakluyt.

Hakluyt took orders, and went to Paris for five years as chaplain to the English Embassy from 1583 to 1588. During all that time he worked assiduously at the object of his life; printing some French accounts of Florida, and the letters of Peter Martyr Anghiera. Returning home, he was appointed to the rectory of Wetheringsett, in Suffolk, in 1590, and married in 1594. He set to work on his '*Principal Navigations*,' a folio volume published in 1589, as soon as he returned from Paris. But it was not until 1598 that the first volume of his more complete work appeared, two others following in the two succeeding years. Then several other most valuable books were brought out under his auspices—the '*Africa*' of Leo Africanus, translated by Pory; the '*Nova Francia*' of Lescarbot; the history of discovery by Galvano; '*Virginia richly Valued*,' being the discovery of Florida by Fernando de Soto; and Mendoza's history of China.

But the great work of Hakluyt is the '*Principal Navigations*,' in three folio volumes, a monument of useful labour. Nothing could stop or daunt him when there was a chance of obtaining new information. He rode 200 miles to have an interview with the last survivor of Master Horn's expedition to America in 1536. He saved numerous journals and narratives from destruction, and the deeds they record from oblivion. His work gave a stimulus to colonial and to maritime enterprise, and it inspired our literature. Shakespeare owed much to Hakluyt's '*Principal Navigations*;' Milton owed much more. As the years passed on, Richard Hakluyt, in his own quaint language, continued "to wade still further and further in the sweet studie of the historie of cosmographie;" and he achieved his great task, which was, in his own words, "to incorporate into one body the torn and scattered limbs of our ancient and late navigations by sea." He declared "geography and chronology to be the sun and moon, the right eye and the left, of all history."

When Richard Hakluyt died, on November 23, 1616, he was Archdeacon of Westminster, and had reached his sixty-fourth year. By his will he left legacies to many relations, accompanied by kindly words; and it is interesting to be able to believe, from his bequests to Dr. Wilson, the head master of Westminster, and to his predecessor, Dr. Ireland, that his love for his old school, "that fruitfule nursery," as he called it, continued through life. Excepting, of course, Shakespeare

and the 'Dii Majores,' there is no writer of the age of Elizabeth to whom posterity owes a deeper debt of gratitude than to Richard Hakluyt, the saviour of the records of our explorers and discoverers by land and sea.

Hakluyt left a large collection of materials, which came into the hands of the Rev. Samuel Purchas, and in due course he published 'Hakluytus Posthumous; or, Purchas his Pilgrimes:' an invaluable work, though injured by injudicious curtailment and omissions. Afterwards, during the last century, the work of Hakluyt was not altogether neglected. There were the collections of voyages and travels made by Harris (1705), Churchill, Astley and Pinkerton (1808-14), and the labours of Dalrymple and Burney. Still the work which Hakluyt considered to be—and which most assuredly is—of the greatest importance to a maritime country, was more and more neglected as time went on. After the death of Hakluyt there was no great English geographer until the time of Major Rennell, and when he died it became a necessity to found the Royal Geographical Society. This provided for existing needs, but there was the same danger as in Hakluyt's time, that the glorious deeds of our explorers by sea and land would pass into oblivion unless his views were adopted and his example followed. With the record of their deeds would also disappear, into what Carlyle calls "the shoreless chaos," all the precious information they collected for the use of posterity.

These thoughts occupied the minds of men with various occupations and callings, but united on the duty of continuing the work of Hakluyt. It was in 1846 that several distinguished persons, so minded, began to consult together and to exchange ideas. So it came about that on December 15, exactly fifty years ago, a meeting assembled at the London Library (12, St. James's Square), with Sir Roderick Murchison in the chair. Literature was represented by Dr. Milman, the Dean of St. Paul's, by Sir Henry Ellis of the British Museum, and by Mr. John Forster; science by Mr. Charles Darwin and Sir Roderick Murchison; geography by Mr. W. R. Hamilton, twice President of the Royal Geographical Society, Sir George Staunton, Dr. Beke, and Dr. Hodgkin; poetry and *belles lettres* by the late Lord Houghton; politics by Mr. J. E. Gray and Mr. Mackinnon; bibliography by Mr. Bolton Corney; the navy by Sir Charles Malcolm and Captain Bullock; the army by Major-General Sir J. F. Briggs, Sir Roderick Murchison, and Sir James McGrigor. It was then resolved "that a Society, to be called the Hakluyt Society, should be formed for the purpose of printing and distributing among its members the most rare and valuable voyages, travels, and geographical records, from an early period of exploratory enterprise to the circumnavigation of Dampier." The eighteen men who passed this resolution were the founders of the Society. Three of them became editors of its volumes. Sir Roderick Murchison was elected

President, and he held the office for twenty-four years: from 1847 to his death in 1871. He was a geologist and a physical geographer, but he was impressed with the value of the information to be derived from the narratives of the early explorers, and with the national importance of recording their gallant deeds, and of placing the history of them within reach of the people. For the 'Principal Navigations' of Hakluyt costs £20, and I believe that £70 is a price fetched for 'Purchase his Pilgrimes.' Sir Roderick was the mainstay of the Society during the first half of its career.

Next to Sir Roderick, the Society owes most to Mr. R. H. Major, the Keeper of the Maps in the British Museum, who was secretary from 1848 to 1856, and was also for many years secretary of the Royal Geographical Society. Under his able management the Society became a great success, which was due to his unequalled knowledge of the subject, to his wide acquaintance with his fellow-labourers in the same field of research, to his readiness to impart his own store of knowledge to others, to his generous sympathy in the work of the editors, and to the charm of his manners and conversation. Although Mr. Major retired from the office of secretary in 1868, he continued to be a most valuable member of the Council for the next thirty years.

When we lost our steadfast old friend, Sir Roderick Murchison, the Presidency of the Hakluyt Society was accepted by Sir David Dundas, an eminent lawyer, one of the most popular men and one of the best *raconteurs* in London of his day, a good classical scholar, and a sound comparative geographer. Like Hakluyt's cousin, Sir David had a very fine library of books of travel at the Temple; and, to compare very small things with great, as Hakluyt's mind was turned to geography by his visits to his cousin at the Middle Temple, so was the bent of my own mind permanently turned to that fascinating science, by my visits to the library of Sir David Dundas, and its charming owner, in King's Bench Walk.

We lost Sir David Dundas in 1877, but fifteen years previously I had made the acquaintance of the late Sir Henry Yule, obtained from him his manuscript translation of Friar Jordanus, and secured him as a zealous supporter of this Society. Sir Henry Yule was the most Hakluytianly-minded man I ever knew. He was like Hakluyt in his minute and conscientious research, like Hakluyt in his imaginative faculty and his poetic instincts, like Hakluyt in his patriotic aspirations, and like Hakluyt he died in harness, working to the last, and presiding over this Society. I think that one of the most touching incidents in the history of literature is the election of Yule to be a Corresponding Member of the Académie des Inscriptions et Belles-Lettres two days before his death, and his reply to the telegram announcing it:—

"Reddo gratias, illustrissimi domini, ob honores tanto nimio quanto

inmeritis. Mihi robora deficiunt, vita collabitar, accipiat voluntatem pro facto. Cum corpore pleno et gratissimo, moriturus, vos illustrissimi domini, salutò."

These are the men who have been our leaders. I purposely, though reluctantly, refrain from any allusion to those who are still living; and I now turn to the work that has been done under their auspices.

It was the original intention to begin the Hakluyt Society's Series with a reprint of Hakluyt's very rare 'Divers Voyages touching the Discovery of America;' but there were delays, and in point of fact it formed the seventh volume, issued in 1852. Since those early days ninety-five volumes have been completed, forming a goodly array. We have done for the last half of this century what Hakluyt did with such enthusiasm and diligence for his Elizabethan contemporaries. The narratives of the old heroic explorers are brought within the reach of the people, often in their own words, if not, in those of a friend or a companion. In our series Azurara relates the noble life-story of Prince Henry the Navigator. There is nothing at second hand. Columbus tells us of his conceptions and aspirations, and of his momentous enterprises, in his own letters and in his journal. John Cabot and Gaspar Corte Real cannot speak to us in their own words, for all they ever wrote is lost; but we have printed the contemporary news-letters and other documents relating to their expeditions. Amerigo Vespucci tells his marvellous tales in his own way. The memorable voyage of Magellan is fully described by Pigafetta; and Fletcher, the chaplain, tells the story of Sir Francis Drake's circumnavigation. Pedro de Sarmiento, whose voyages were caused by the appearance of Drake in the Pacific, relates the story of his explorations of Magellan's Straits, his perseverance and endurance, of his anxieties and sufferings, in his own words. So does Sir Richard Hawkins; and it would be difficult to find a more charming narrative from the day when Queen Elizabeth changed the name of his ship from the *Repentance* to the *Dainty*, to his final capture by the Spanish fleet, in the whole range of autobiographical literature. We have also reprinted the extremely rare history of the discoveries of the world by Antonio Galvano.

Readers who are interested in the discovery of any particular region must needs seek for the gratification of that interest in the Society's volumes. Our labours connected with the Arctic Regions are almost complete. The story of the Zeni voyages has been edited, and their authenticity discussed. Sir Hugh Willoughby's voyage is in the hands of an able editor. The three voyages of Froisher, and the documents in the State Paper Office relating to them, form one of our volumes. De Veer's quaint narrative of the voyages of Willem Barents, with its curious illustrations, has received two editions from our Society. John Davis, Hudson, Baffin, Fox and James, Hall and Munk, have all been exhaustively treated in our series.

Turning to the east, the Hakluyt Society presents its members with the early voyages to India and the Eastern Archipelago. The 'Lendas' of Gaspar Correa are translated to inform us respecting the voyages of Vasco da Gama. John Davis narrates the events of the first Dutch voyage to the East Indies, and the story of the first English voyages under Sir James Lancaster are told by his mates. Having reached India in the delightful company of these worthies, the reader of our series can rove all over the East under the guidance of the rarest companions. With Clavijo he can visit the court of Timour; old Friar Jordanus will introduce him to the marvels of India; Memloza, Adams, and Cocks to those of China and Japan; Varthema will conduct him on a pilgrimage to Mecca; Sir Henry Yule's wandering friends will show him Cathay and the way thither: in short, there is scarcely a corner of the East that is not described by one or other of the illustrious men who have been saved from oblivion by the Hakluyt Society. Herberstein, Giles Fletcher, and Jenkinson describe Russia in the olden time; while Africa is laid open to us by Father Alvarez, who takes us to the court of the Negus of Abyssinia; by Barbosa, and by that most garrulous and informing of Moors, Leo Africanus. Our volumes also tell of the discovery and planting of the Philippine isles, of Bermuda, and the Canary isles; enlighten us respecting the strange birds of Rodriguez and Mauritius; and fully inform us touching the early voyages to Australia.

America, North and South, have received equal attention. With Hernando de Soto we visit Florida, and with Strachey we learn all details respecting the first planting of Virginia; while Champlain takes us to Mexico, and we can march through the dense forests, amidst which the wonderful temples of the Mayas were concealed, in company with the great conqueror, Hernan Cortes. In South America we learn all the wonders of the Orinoco from Sir Walter Raleigh; descend the Amazons with Gonzalo Pizarro and the tyrant Aguirre; live amongst the Brazilian savages with Hans Stade; pass up the Rio de la Plata to Paraguay with Cabeza de Vaca; and learn all the wonders of the discovery and conquest of Peru, and all the enthralling details of Inca civilization from the very Conquistadores themselves, or their priestly companions, and in their own words.

This represents the labour of fifty years; and when it is remembered that our editors work gratuitously, and for mere love of their authors, and that every volume has an introduction, and is annotated so as to give the reader all the help he can require in his study of the text, I submit that it is good work with some confidence of a favourable reply.

In conclusion, I wish to say something with reference to the *name* of the work of this Society. There can be no question that a study of the heroic deeds of explorers, the contemplation of their high qualities, and

the acquisition of all the valuable knowledge that their narratives impart, arouses emulation, excites a feeling of sympathy which is ennobling to those who are under its influence, and is an important education in itself. It is true that we have only 340 members, although I hope there will be more before this evening is over; and it may be thought that the influence of our work, excellent though it must be admitted to be, cannot be very widely diffused. But this is a great mistake. Many of our subscribers are libraries, clubs, and public offices, where the volumes are within the reach of numerous readers. Besides, our influence is by no means confined to the actual readers of the volumes. It passes on, and is felt at second or third hand throughout the length and breadth of the land, as well as in the United States; whence we receive so much and such generous support. There is no book describing old voyages and travels which is not indebted to the Hakluyt Society, generally without acknowledgment, often without knowledge of the fact, for compilers seldom seek the fountain-head. The fact, however, is certain, as all who are well versed in this class of literature must be aware. Old blunders have been put aside, formerly accepted errors have been exploded, fresh facts and fresh traits of character have been generally adopted, which are all traceable to our labours. Misconceptions have been cleared away, much greater accuracy has been secured, and the most attractive as well as the most generally useful branch of education has been elevated and purified.

Nor has the usefulness of our work stopped there. If the hopes of the men of letters among our founders have been realized, those of the men of science, of Charles Darwin and Roderick Murchison, have assuredly not been disappointed. The phenomena of natural science have received elucidation, not once but frequently, from evidence which can only have been derived from information first made known in our volumes.

From histories, narratives, and educational books, we may turn to poetry and works of fiction, and there again we shall see the usefulness of the Hakluyt Society. But I have only time to allude to one instance out of many. Charles Kingsley, in his glowing descriptions of tropical scenery in 'Westward Ho!' was much indebted to the Society's edition of Raleigh's 'Guiana,' edited by Sir Robert Schomburgk, and to others of our volumes, of which he often spoke to me in terms of admiration.

I have now given you some account of the great man after whom the Hakluyt Society is named, of the foundation of the Society, of the work it has done, and of its usefulness. My last words must be to the effect that much work remains to be accomplished, and that our prosperity depends upon an increase to the number of our members. I am almost inclined to go so far as to say that, looking to the influence of its work for good, the well-being of the Hakluyt Society is one sign.

and not an insignificant one, of healthy tendencies of thought, and of healthy aspirations among the peoples who speak the English language.

At the conclusion of the address, Lord Loch moved a vote of thanks. After referring in complimentary terms to the great work which the Hakluyt Society was doing, he said that there was one omission in the interesting and instructive paper to which they had just listened; for Sir Clements Markham, while dwelling upon the services rendered by others, had said nothing regarding his own valuable services both to the Society and to the cause they had at heart. Sir Clements had been Secretary from 1858 to 1887, a period of thirty years, and President since December, 1889; while to his accomplished pen were due about twenty of the Society's publications.

Admiral Sir Anthony Hoskins, in seconding the proposal, referred to the naval experiences of Sir Clements Markham as having been of great value in his geographical and literary work. Sir Henry Yule had been described in the address as a "Hakluytianly-minded man." He (the speaker) thought that the term might be applied with equal fitness to their esteemed President.

The vote of thanks was passed unanimously, and Sir Clements Markham briefly replied.

The guests next proceeded to examine a small collection of books and maps of the Hakluyt period, mostly from the library of the Royal Geographical Society. Early editions of Hakluyt, Eden, and other geographical writers were shown, as well as an interesting manuscript volume (lent by the India Office) containing the early Court minutes of the East India Company, in which there is an entry of a payment to Richard Hakluyt, in February, 1601, of ten pounds "for his travails taken in instructions and advices touching the preparing of the voyage" to the East Indies, and "thirty shillings for three maps by him provided and delivered to the Company." Mr. Silver brought for inspection a number of interesting manuscript journals and drawings by Sir Joseph Banks. There were also the Ortelius and Saxton atlases; while the tapestry map of Warwickshire, dated 1588, kindly lent by the York Philosophical Society, was hanging from the gallery.

NOTES ON A JOURNEY ROUND MOUNT MASAWA OR ELGON.*

By C. W. HOBLEY.

THE following is an account of a journey in the early part of this year (1890) to Mount Elgon and the surrounding region.

The starting-point was Mumia's, the headquarters of H.M. Government in the district of Kavirondo. Crossing the river Nzoia, the first

* Kindly placed at the disposal of the Society by the Foreign Office. Map, p. 218.

four days' march lay through the country of the Wa Ketosh, a tribe of Bantu origin, having many good characteristics, and speaking a language little different from that of nearly the whole of Kavirondo. They are an agricultural tribe, living in villages with lofty mud walls, often loop-holed, and surrounded by deep ditches. Although a true agricultural tribe, they are great cattle-breeders, and also clever workers in iron.

The southern part of Ketosh is a rolling grass country, but as one approaches the mountain it becomes well wooded, and at the same time less thickly populated; it is abundantly watered throughout, every valley containing a running stream. Of these streams those to the east and south belong to the Nzoia basin, those to the north and west run direct to the Victoria Nile: and between these two drainage areas there is a narrow tract of hilly country, the drainage of which runs west to form the Sio river.

Early on the fourth day the base of the mountain was reached, and we encamped at the village of Mongichi, the principal chief of the Wa-Lako, the most important tribe on the south side, and were received in a most cordial manner. Three tribes have their habitat on the south side of the mountain, the El-Gonyi, Wa-Lako, and Wa-Kamuni, the latter on an offshoot of the Wa-Ketosh, and the two former, in common with several tribes on the north side of the mountain, form a separate group having nothing in common with the general Kavirondo type; from an examination of their language, they appear to belong to the same stock as the Wa-Nandi. In the absence of definite information, it was formerly thought that the latter belonged to the Masai family; but this does not appear to be the case, and sooner or later they will probably be classed with the tribes to the north, the Rendili, Burkenji, and others, and be found to belong to the Galla group. Even if the Masai be also placed in this group, it will, I think, be found that their relationship is more distant than that of the above-mentioned tribes.

The Wa-Lako and El-Gonyi are a fine-built, warlike race, armed with spears; they depend principally on agriculture, but have strong pastoral instincts. They formerly lived entirely in the numerous caves with which the south side of the mountain abounds, but, the times becoming more settled since the advent of Government protection, they are gradually deserting their caves and settling in villages at the foot of the mountain. Many of the men have a handsome type of face, and have a much longer growth of hair than is usual in Africans; this they fasten up into two tails, one hanging down the back, and the other projecting out above the forehead like a horn, and the effect is rather striking.

The west side of the mountain being quite virgin ground to an explorer, it was decided to visit it.

Leaving Mongichi's and working round to the north-west, the country of the Wa-Kamuni was first passed through. Like the Wa-

Ketosh, the Wa-Kamuni live in fine walled villages; they principally cultivate the banana.

Immediately under the prominent west bluff of the mountain are situated the Wa-Poto tribe, and at this point the walled villages, so typical of Kavirondo, completely cease, and henceforward give place to mere clusters of huts without any works of defence.

We now began to enter a large area of country intersected by numerous steep valleys of exceptional richness, and as we proceeded it became more fertile, more thickly populated, and more beautiful.

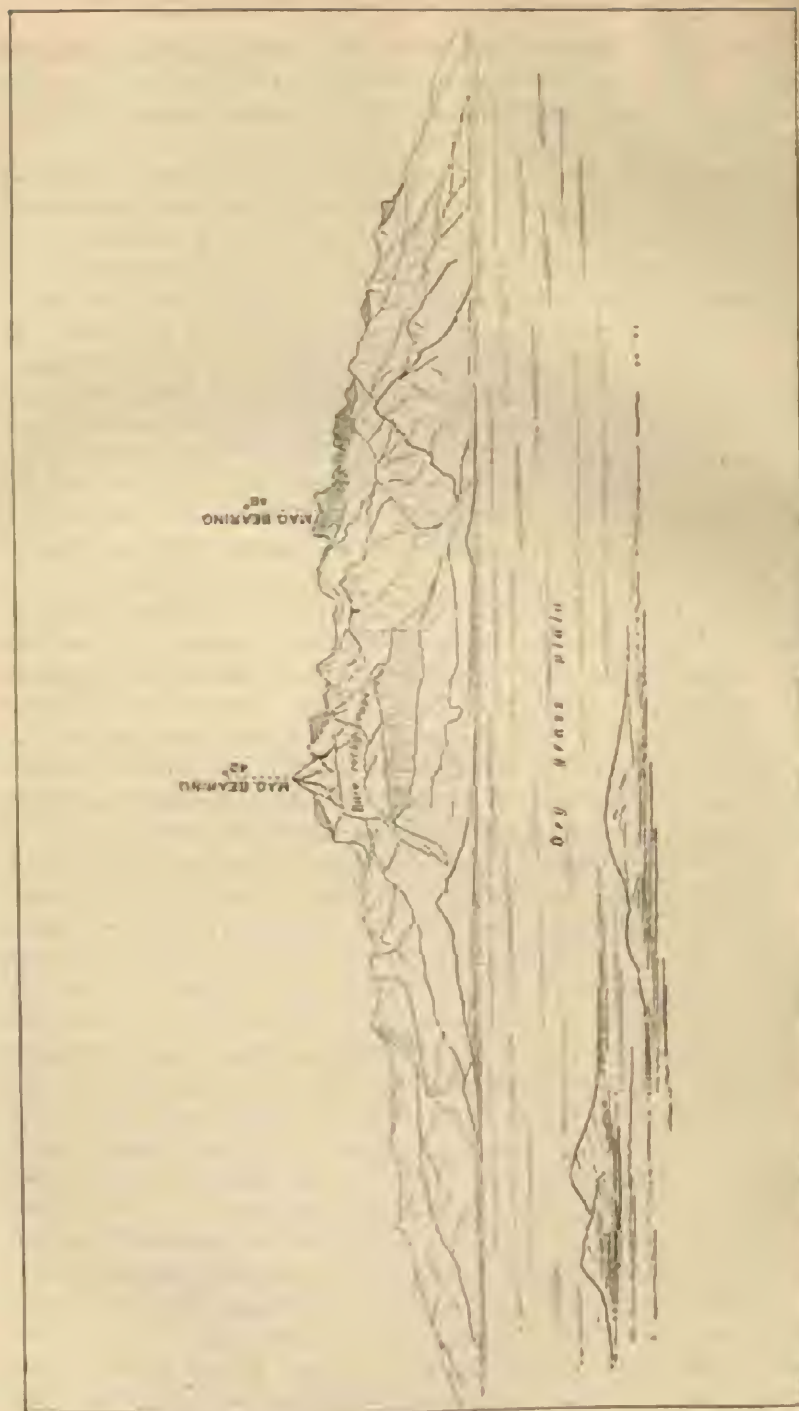
The inhabitants fled at our approach, driving off their cattle; but we soon got into communication with them and allayed their fears. They then guided us ahead, and we reached a tribe called the Wa-Koko, who insisted upon the performance of certain ceremonies before we went further. A beast was killed, and a medicine man examined the entrails with a view to discover if our visit boded for good or otherwise. The augury proved favourable, and they at once proceeded to spatter my men with the contents of the bullock's stomach, which, it appeared, was a sign of great good-will. The men, half amused and half angry at this novel pleasantry, returned the compliment with great zest, and in a little time every one was in a most unpleasant condition and in the best of humours. Needless to say, I hastily retired to my tent at an early stage of the proceedings.

We were now at the foot of a large mountain called Busano, which is situated some 10 miles to the west of Elgon. The southern slopes of this mountain are densely populated by a tribe called the Wa-Tata, who at first seemed inclined to stop our progress; but an understanding was eventually arrived at, and we proceeded unmolested, and crossed the Busano mountain, after a steep climb, by a pass at the height of 6640 feet.

The upper part of this mountain is covered by a forest of magnificent timber, among which tree ferns, giant senecios, and wild bananas flourish in luxuriance.

The summit of the pass being reached, we were relieved to descend into more level country, for between Mongichi's and this mountain the whole country is a succession of precipitous hills, which it is impossible to avoid; but from a scenic point of view it is of rare beauty, additional charm being added by the luxuriant banana plantations with which all but the very steepest hills are clothed from foot to summit. Away to the west the valleys, as fertile as ever, widen out in the direction of the Nile.

On the north side of Busano mountain we passed through a succession of small tribes, the Wa-Matanda, Wa-Fumba, Wa-Konde, Wa-Mruma, and Wa-Muhasa, who inhabit a large tract of fertile, well-wooded country, in which bananas grow in such profusion that large quantities ripen and rot in the plantations ungathered. These people are all friendly and inoffensive; they are entirely unacquainted with cloth and beads,



STREET, BATHURST, FROM 1810

the usual trade goods, and have no word in their language to express the same; a few cowries were seen, and these, it was found, were imported from Uuyero, being passed on through the intermediate tribes. All these tribes belong to the Kavirondo stock.

A considerable stream, the river Namatari, flows through the heart of this country. The presence of the river was quite unsuspected until we were in close proximity to it, for it runs along at the bottom of a deep cañon some 250 feet below the general contour of the country.

Leaving Muhasa, we bore north-east across a wide uninhabited grass plain, evidently very swampy in the rains, and struck the north-west corner of Elgón. The outline of the mountain is here very clearly defined, descending as it does by a regular series of abrupt steps and gentle slopes to the vast level plains which run north as far as the eye can reach, in the direction of Turkana and Lobbor. In this plain, some miles to the north and north-west, lie the chain of lakes first seen by Mr. Jackson from Savei in 1890, and the largest of which was named Lake Salisbury by him. Their shores are peopled by a large tribe called the Wa-Kumama, who are constantly raiding the inhabitants of the mountain. I regret that want of time prevented my visiting them, as I suspect these natives are the most southerly extension of the Nile valley tribes. It has been suggested that these lakes are mere lagoons produced by the overflowing of the Nile when in flood, and that they disappear as the Nile falls; but this is not, I think, the case, for the date of my journey was at the latter end of a long dry season, and three large sheets of water were to be seen, with clearly defined shores, and what appeared to be trees growing to near the water's edge.

The north-west flanks of the mountain are inhabited by a tribe called the Wa-Mbai, and further to the east occur a people called the Wa-Sor, and still further east occur the Wa-Savei; all these tribes belong to the same class as the Wa-Lako. The two former cultivate bananas in profusion, also yams, and the latter principally millet. All this country, situated as it is on the lower slopes of the mountain, at an altitude ranging from 6000 to 7000 feet, has a most delightful climate, and it is perfectly watered by numerous streams of icy cold water from the upper part of the mountain. Several waterfalls of great beauty were discovered; the first of these, which has a sheer drop of about 60 feet, I have taken the liberty to name after Mr. F. J. Jackson, who was the first European to ascend the mountain.

The district of Savei has become well known as a great halting-place for Swahili and Arab caravans going north to trade for ivory at Ngaboto and Turkana; nearly all visit this place to purchase a stock of food for the onward journey, food being practically unobtainable for a long way north, as the tribes mostly live by hunting. Owing to long intercourse with these coast traders, the Wa-Savei are somewhat more civilized than their neighbours, and, as a mark of confidence, the chief

sent his son back with us to Munia's, in order that he might see the place.

Standing on the slopes of Elgon, in the neighbourhood of Savei, and looking north, one's attention is at once arrested by the fine mountain of Dabasien, which rises abruptly from the plain some dozen miles away. It is as rugged a mass of precipitous crags of bare rock as one can well imagine; but I understand the northern flanks are more fertile, and are populated by the Wa-Kakisera. The atmosphere in this region is particularly clear, and the vivid scenic effects produced by the gleam of the morning or evening sun upon the brilliant pink and amber-coloured crags of Dabasien may not easily be forgotten.*

Leaving Savei, and working round the lower slopes of the mountain in a south-east and south direction, our road for about two days lay through a country clad with forest intermingled with scrub; after that the timber thinned out and became of poorer quality, and the whole country bore evidences of a much lighter rainfall than prevailed on the west side. With the exception of wandering parties of Wa-Koromojo, who live by hunting game, this tract is devoid of inhabitants. The Wa-Koromojo are very clever at trapping game by means of ingeniously placed nooses of hide rope. One of these is buried over a hollow in the ground; the animal treads into the hollow, and its foot becomes entangled in the noose; a heavy log of wood fastened at the other end of the rope impedes the animal's progress, and enables the hunter to overtake and spear it. The east side of the mountain above 7000 feet is covered by dense forests, the haunt of numerous herds of elephants, and also the nearly extinct African buffalo.

Reaching once more the south side of the mountain, the El Gouyi were met with. They reside almost entirely in the large caves which abound on this face. Some of these caves are of considerable size, running back for as much as 150 yards, and inhabited by large numbers of people. At the mouth of the cave a barricade of timber is erected, with perhaps a couple of tiny gates, and inside this barricade is a large open place, in which are erected the granaries of the community; and then leading off in various directions are lanes lined with little stockades, in each of which resides a family. These passages are crossed at intervals by barricades, and stagings are built over the doors, upon which certain of the young warriors sleep, ready to spear any foe who attempts a night attack. The inner recesses of the caves are usually very low, and here the tribal flocks are nightly driven for safety.

It is remarkable to observe the way in which the inhabitants have adapted themselves to their gloomy surroundings; they appear to

* This is clearly Mr. J. Thomson's Douyo Lamboto and Mr. E. Gedge's Mount Lekakisera. Mr. Thomson's Lekakisera corresponds to Mr. Gedge's Dabasien, and lies about 70 miles to the north of Mount Elgon.—E. G. R.

develop a special power of sight, and run about at full speed in the dense darkness of the passages with the greatest ease and confidence.

The caves are very dry, and the attrition of human feet through long ages has worn away the rock and produced a fine floury dust, in which one sinks nearly ankle-deep. I dug down in one of the caves to a depth of some feet through this gray dust, but no remains of any kind rewarded my search. There was a marked absence of stalactitic growth in all the caves visited; in only one was there a small trickle of water from the roof.

It has been suggested by Joseph Thomson and others that these caves are of artificial origin, but, after visiting and carefully examining several, I was unable to accept this theory, and, as far as I can judge, they appear to be undoubtedly due to natural causes, and excavated by water, and it seems to me extremely probable that the flanks of Elgon were denuded by the waters of the Victoria Nyanza, the excavation of the caves being part of such denudation.

Most recent observers have been struck by the way in which all this part of Africa is composed of a series of troughs and ridges running roughly north and south; first the Ukamba ridges, then the Athi trough, the Kikuyu ridge, the Naivasha-Baringo trough, the Mau ridge, the Rangata Nyuki trough, the Kabras-Elgon ridge, the Nyanza trough, Unyoro ridge, and Albert Nyanza trough.

As the Earth continues to contract, the natural tendency of the ridges is to rise and the valleys to deepen. Then, looking back to past ages, it is quite possible to conceive the Albert and Victoria Nyanza joined and forming one mighty inland sea, washing the slopes of Mount Elgon, which then only rose to a comparatively insignificant height above the waters; for it must be remembered that caves are found on the mountain to a height of about 8000 feet. As the crumpling proceeded the mountain gradually rose, presenting lower and lower portions to the denuding action of the waves; at length a minor fold appeared in the centre of the great sea, producing the Unyoro ridge, and splitting it into the two lakes; and eventually the Victoria Nyanza receded altogether from the mountain, and took up its present limits.

I put forth this explanation in a tentative manner, but it appears to me to explain the existing situation, and, in support of it, I may mention that traces of ancient beaches may be seen in various parts of Kavirondo, many miles from the present shores of Lake Victoria.

With regard to the structure of the mountain, I can only speak of the lower part up to an altitude of some 8000 feet. This is composed of alternate layers of volcanic ash and volcanic agglomerate; lofty precipitous cliffs mark the outcrop of the agglomerate, and gentle slopes the outcrop of the softer ash interbedded with the agglomerate. And it is in the face of these water-worn, wave-washed cliffs that are found

the caves, for all the world the same as numberless caves in process of formation on many a rocky shore at the present day.

A vast number of streams have their source on the mountain, and carve its flanks into picturesque ravines. The bulk of this water eventually finds its way to the Nile, but not directly so. The streams on the south and south-east run into the Nzoia river, and so into the Nyroza; those rising on the south-west and west sides run direct into the Nile, probably in the neighbourhood of Lake Gitanzige; while those on the north-west and north eventually reach the Nile by way of the big chain of lakes, which are supposed to debouch into Lake Kioga.

But to the east and north-east we get streams belonging to an entirely different system. I refer to the Turkwel river and others which unite and flow away to Lake Rudolf. One of these streams, named the Shwam, is notable, inasmuch as it rises in the centre of the crater of the mountain, and it has carved a deep gorge through the crater wall, which presents a very striking appearance from the plains to the east.*

Curiously enough, none of the tribes on or surrounding the mountain have any knowledge of the popular name for the mountain (Elgon), and I believe this to have been derived in some confused manner from the name of the tribe on the south side, the El Gonyi. The Wa-Kitosh call the mountain Masawa; the Wa Lako Masawa Tukul; and the tribes on the west side use the name Ruteka. Masawa is the name that is most widely known.†

Having now made a complete circuit of the mountain, we returned to Mumia's, after a pleasant journey of about a month's duration.

THE SUPPOSED DISCOVERY OF SOUTH AMERICA BEFORE 1448, AND THE CRITICAL METHODS OF THE HISTORIANS OF GEOGRAPHICAL DISCOVERY.

By J. BATALHA-REIS.

In an extensive memoir; Sig. Carlo Errera studied anew the nautical map of 1448 by Andrea Bianco, and discussed the interpretation given by Mr. Yule Oldham, since 1894,‡ to a portion of it.

I take this opportunity of preventing the most important ideas of the Italian historian, to call the attention of the historians of geography to some neglected

* The Shwam is Mr. Gedgo's Angelol, called Soma in its lower courses.—E. G. R.

† The mountain is also known as Masawa (Masawa) on Lake Victoria, where Mr. H. M. Stanley heard the name in 1875. Mr. J. Thomson calls Kitosh Masawa, and the mountain Elgon; Emin Pasha heard of a tribe Wa-Sawa (Wa-Savin?).—E. G. R.

‡ "Della Carta di Andrea Bianco del 1448 e di una supposta scoperta del Brasile nel 1447," *Memorie della Società Geografica Italiana*, V. Parte 4^a, pp. 222-225 (Rome, 1895).

§ 'British Association, etc., (Oxford,' p. 715 (London, 1894); Royal Geographical Society, November, 1894; *Geographical Journal*, March, 1895, pp. 221-230.

reasons and documents, as well as to some generally employed, but, in my opinion, incorrect methods of criticism, which not only concern the particular subject now under discussion, but many other points in the history of discovery.*

Blanco's map of 1448, and both Mr. Yule Oldham and Sig. Carlo Errera's "Memoirs," raise many important and complex questions of geographical history. I merely propose now to study one of the special problems offered by that map, and interpreted by Mr. Yule Oldham with so much originality.

1.

At the lower left corner of an irregular piece of vellum an extensive land is represented, some 100 or 200 miles, if we consider the scale of the map (300 kilometres according to Sig. Errera, 400 according to Mr. Yule Oldham), south-west of Capes Verde and Roxo,† which are drawn at the southern extremity of the coast of Africa, where the latter suddenly turns sharply eastwards. This is the most original feature of the 1448 map.

The land represented on the left corner shows a promontory, as an angle turned north-east, the two sides of which (one east to west, the other north to south) are supposed to continue beyond the map, evidently showing Blanco's intention to represent a land larger than what the asymmetrical or torn-off corner of the parchment could have afforded space for.

On this land a legend, in two lines, has been subjected to various interpretations. Mr. Yule Oldham reads it,‡ "Isla^s otinticha xell longa a ponente 1500 mia,"§ and translates, "Authentic island is distant 1500 miles to the west."

In only one point does Sig. C. Errera differ from Mr. Yule Oldham's reading and interpretation: where the latter reads 1500 miles, the former sees 500, the first supposed figure being, in Sig. Errera's opinion (and, as he says, in the opinion of P. Coriani, curator of the Ambrosian Library at Milan), only one of two brackets. All other authors who have discussed the subject read "1500 miles."

I must declare that I do not know the original manuscript of Blanco's map, but only Prof. Fischer's** and Mr. Yule Oldham's facsimiles, which, being photographic, cannot have the features of the original essentially altered. In both I believe to have distinctly seen, by the help of powerful lenses, the figures 1500 with all the peculiarities of mediæval Gothic writing. After the two cyphers of the number 500, there is not exactly a figure, or even a well-defined line, corresponding to the supposed first bracket, but only a black spot connecting the lower part of the second cypher with the dark stained edge of the parchment. From that

* In the study and discussion of questions related to the history of geographical discovery, the Portuguese documents are, as a rule, the most neglected of all. Of these many were long ago collected in various publications which it would be very useful to bring to the knowledge of the students of geographical history in a comprehensive review. A new and more correct collection of some of them was recently published ('Alguns Documentos do Arquivo Nacional da Torre do Tombo acerca das Navegações e Conquistas portuguesas publicadas por ordem do governo de S. M. P. ao celebrar-se a Comemoração quadricentenária do Descobrimento da America,' Lisboa, 1892), to which I shall hereafter often refer.

† See facsimile, *Geographical Journal*, March, 1895, p. 224.

‡ *Geographical Journal*, March, 1895, p. 226.

§ *Isle for isle*: J. Leardus on his 1448 map (Venice).

¶ "Questo al xe lo smatramento," A. Bianco, 'Atlante' (1456), B. 1.

‡ *Mia for millia or miglia*: Fra Mauro, map of 1459 (Venice).

** 'Sammlung mittelalterlicher Welt- und Sen-Karten italienischen Ursprungs' (Venedig, 1895).

black spot the ink seems to have spread upwards. The supposed second bracket thus looks entirely an accidental stroke, like many others to be seen all over old maps.

The word *otinticha* is, as a matter of fact, still now pronounced (and perhaps written) under this form in Venice.*

By *otinticho*, or "authentic island," Andrea Bianco seems to have, in fact, meant an island which had been undoubtedly seen by somebody, and on which undoubtedly somebody had landed.

Although considering that the word *lunga* is more frequently used, in old and new Venetian, to mean *lunga*, "long," therefore expressing how large the authentic island was, still Sig. Errera assents to its being often used for *lontanu*, or "distant,"† from Europe or Africa, in the case under discussion, and more probably from the nearest point in the latter continent—Cape Verde. This distance should be, according to Mr. Yale Oldham's reading (and, as I showed, to my own), 1500 miles (500 miles to Sig. Errera's); but it is only 100 or 200 miles in the scale of the map.

Now, in the relative position occupied by the *authentic island* (south-west of Cape Verde), and with the relative dimensions, no doubt intentionally sketched by Bianco, there is no extensive land at 100 or 200 miles from Cape Verde or any other part of the African coast.

The authentic island is on the furthest corner of the map (south-west of Cape Verde) that was available, marked as extensively extending along the edge of the parchment, but only shown by a strip wide enough to be seen and to admit of a legend being written on it. The *new island*, in the existence of which Bianco believed, was evidently not supposed to exist to the north or west of Europe or Africa, where the parchment would have afforded plenty of room for its location, but distinctly to the south-west of Cape Verde. Whether referring to the breadth or extension of the *new island*, or to its distance from any given point on the map, such a legend would have been superfluous, had circumstances allowed the newly discovered land to be located in its proper place. No other land on the map shows any verbal or numerical explanation as to dimensions or distances. Of the *new island* one circumstance had above all to be represented, namely, its relative position to other lands, comprising (a) its orientation, (b) distances from them, and (c) its dimensions. The parchment being too small, only the orientation could have been graphically shown. Of the other two circumstances, one could more easily be known, which was, in any case, precisely the most urgent for explorers to know, and the most necessary to correct the otherwise obvious but misleading reading of the map:—this was the real distance at which the *new island* had been seen, although represented at 100 or 200 miles from Cape Verde. Were the dimensions of this island known, they could only have been written as a secondary indication. Moreover, the person who saw, or pretended to have seen, the *authentic island* could not have sailed, observed, surveyed 1500 miles of coast, but could have roughly estimated 1500 miles distance from the nearest point on the known continent of Africa.

Do the 1500 miles mean the "extension" of the *new island*? Then the island is correctly located on the map, at 100 or 200 miles from Cape Verde, and, as I have said already, there is no important land due south-west at that distance. If the 1500 miles cannot refer to "extension," they must refer to "distance." And

* "*Otinticha*, my ont popular chases, . . . *monna' trica*, 'genuine'" (Giuseppe Boerio 'Dizionario del Dialecto Veneziano,' 2 ed. (1858), p. 459 (Venice)).

† Also *lonzi* and *lunga*.

there was, and there is, land, with the essential features sketched by Bianco, about 1500 miles, or a *long distance** south-west from Cape Verde.†

The most important objection Signor C. Errera presents to this part of Mr. Yule Oldham's solution of the problem is that, if the 1500 (or 500) miles mean the distance of the *new island* from Cape Verde, that distance is due to the *ponente*,—that is to say, to the west,—while the *stinlicha* is distinctly located to the south-west. But if the Italians called the west *ponente*, they called west-north-west, *ponente maestro*, the west-south-west *ponente libeccio*; and, in a general and summary way, *ponente* would have been used—as a generic name—for all the west, from north to south, principally in a note hastily written on a map made on imperfect parchment, and therefore only considered as a provisional sketch.‡

If we consider, on Bianco's map, the sketch of the *new island*, we see clearly that his intention was to represent an extension of land larger, at least, from east to west, than twice the east-to-west width of the area occupied by the whole Cape Verde archipelago.

The essential points established are, therefore, in my opinion, that in 1448 Andrea Bianco believed:—

- (a) That somebody had certainly seen an island, and perhaps landed on it;
- (b) That this island was, at least, wider from west to east than the distance say, between Cape Verde and the Arguin bank near the African coast;
- (c) That this island was south-west of Cape Verde;
- (d) At a great distance from it—in any case greater than 100 or 200 miles, and probably at about 1500 miles;
- (e) Shaped like an angle, the vertex of which pointed to the north-east—to the Cape Verde—and with sides east-west and north-south respectively.

If, then, it is proved that any land exists agreeing with the essential conditions stated, it will be, in my opinion, much more rational to suppose, that in 1448, or previously, somebody had actually seen the land represented on the map, than to admit that, by a mere chance, invention and reality have so entirely coincided in *relative position, shape, and dimensions*.

The problem thus presented, its solution merely consists in ascertaining whether some land exists—*island or continent*—in agreement with the conditions mentioned.

There exists, in fact, a land:—

- (a) Larger from east to west than the distance between Cape Verde and the Arguin bank;
- (b) South-west of Cape Verde;
- (c) At 1520 miles from it;
- (d) In the shape of an angle having its vertex to the north-east—that is to say, to Cape Verde.

This land is the north-east promontory of South America.

* Yule Oldham, *Geographical Journal*, March, 1895, pp. 227, 228.

† The word *authentic* and the mention of the number of miles (whether these refer to the new land's extension or to the distance from Africa), being information not to be found on any other land represented on the map, are facts which mutually corroborate each other.

‡ There are thousands of analogous instances. I find one on opening the book I happen to have at hand: Ramusio ('Discorso sopra la terra ferma dell' Indie occidentali,' etc., iii. f. 117, ed. 1585), describing the coast of Labrador, speaks of a "Capo del gado, which is in 54°, from where the coast runs 200 leagues (*per ponente*), to the west, up to a great river called San Lorenzo." Now, the mouth of the river San Lorenzo is south of 54°, and south-west of the cape under 51°.

According to what I have previously established, the problem thus seems to be entirely solved. This is Mr. Yale Oldham's opinion: his originality consists in having suggested the only solution to this problem which gives satisfaction to all its essential requirements.

To this solution, after what has been adduced against Mr. Yale Oldham's arguments, there are, apparently, some circumstantial difficulties, principally derived from the fact of the historians who discussed the subject having forgotten, to a great extent, Portuguese authorities and documents, as well as from the generally illogical methods employed by geographers in discussing historical problems.

II.

If really any land south-west of Cape Verde were known before 1448, how can we account, says Sig. C. Errera, for "the silence of all sources [of information] . . . for the ignorance of the Portuguese government itself?" "It is certain," the Italian historian continues, "that the Portuguese of the fifteenth century entirely lacked knowledge of any land to the south-west, nor is there the slightest trace of such a knowledge." "None of the cartographers of the second half of the fifteenth century," Sig. C. Errera assures us, "represents the mysterious land of *Biancho*."

On this point Sig. C. Errera's argument is typical of one of the unconscious erroneous processes of criticism so common among those who discuss the historical problems of geographical discovery. These historians speak as if all the maps that were drawn, and all the documents that were written in the world, existed in unaltered condition, systematically classified and kept in public archives. To ascertain that a supposed geographical discovery was not registered on any map, if all maps were in existence, and all the existing maps were known, would undoubtedly have been a very important argument indeed, very different from that which, under the limitation of actual circumstances, Sig. Errera, or any historian, is authorized to employ. As things really are, Sig. Errera should, I think, have prudently limited himself to speak of the cartographers he knows, or of whom information has reached him. What follows will show that the process employed by historians, being wrong, is therefore dangerous.

When, in 1500, Master João, "Bachelor in Arts and Medicine, Physician and Cosmographer to D. Manuel of Portugal," writes to the king, in his letter of May 1,[†] about the land just found, in what to-day is called South America, by the fleet of Pedro Alvarez Cabral, on board of which he was, Master João says that *these lands might the king see represented on the mappamundi which Pero Vaz Diogo had*, with the only difference, he adds, that the said mappamundi does not mention if the land was inhabited or not, while he, Master João, could certify it (Brazil) to be very well peopled.; Master João remarks, besides, to the King of Portugal (no doubt for him to well distinguish the map from others on

* *Loc. cit.*, p. 219.

† But begun April 28: "Yesterday, Monday, April 27."

‡ This document was published (by Varnhagen) in 1848: '*Revista trimestral do Instituto historico e geographico do Brazil*,' v. p. 342 (Rio de Janeiro); and again in F. A. de Varnhagen's '*Historia geral do Brazil*,' i. pp. 423, 424 (Madrid, 1854). The original manuscript is in Arch. nac. Torre do Tombo, 'Corpo Chronologico,' parte 3, Mapa 2, doc. No. 2. It was recently published in the '*Memorias da Comissao Portugueza, Centenario da Descoberta da America*' (family), pp. 61-63 (1892) (very incorrectly); and in '*Alguns Docum. do Arch.*,' pp. 122, 123 (Lisboa, 1892). This last is the only correct transcription.

which, probably, more lands were represented on the Atlantic), that the *mapamundi* was *old* (ancient, *antigo*)* and had "the Mine"—a *Mina*, or São Jorge da Mina, on the north coast of the present Gulf of Guinea (the locality, on English maps and books, so unaccountably called "Elmina"). As the Portuguese reached this point in 1482, Sig. Errera may see clearly that, in opposition to his categorical assertion, there really existed cartographers who, in or before the middle of the fifteenth century, represented on their maps a land occupying a place on the coast of Brazil so exactly, or so approximately, that such a cosmographer as Master João considered it to be the very same country in which, in 1500, he landed.

In that same letter Master João tells D. Manuel how he and the pilots of Cabral's fleet ascertained the latitude of the land discovered, which they found to be 17° south. This circumstance (added to the remark that the map to be seen in Portugal was *old*) proves that, in his reference to the *mapamundi* in possession of the Bisagudo,† Master João did not mean any of the lands already found, more to the north, by Columbus or his companions and followers.

Having remarked that the new land discovered by Cabral was represented on the map of the Bisagudo, Master João directly adds, that at first (in fact, for five days)‡ the said land was supposed to be an island,§ or four islands together, which may have meant that the land was represented as an island on the *mapamundi* quoted, and that they themselves at first thought it to be one—this, at all events, proving, once more, that continents may be taken for islands, even after four days' exploration along their coasts, and, therefore, that the north-east point of South America might also have been taken for an *authentic* island.]

But if it is an absolutely proved fact that, on a map of the fifteenth century, there was land represented to the south-west of Cape Verde, and if we assume that the knowledge of it might have influenced the direction taken by the expedition of

* This map existed in Portugal at least since March, 1300, when Cabral sailed. The designation of *old* (*antigo*) given to it by Master João proves that it could not be more recent than the middle of the fifteenth century.

† Pero Vaz da Cunha, nicknamed "the Bisagudo," who was sent in 1488, by D. João II. of Portugal, to build a fortress in the Senegal. Ray de Pin, 'Chronica de . . . D. João II.,' cap. xxiii.; "Collecção de Livros Incritos da Historia Portuguesa," II, pp. 93, 94 (Lisboa, 1702); Garcia de Rezende, 'Vida . . . de . . . D. João II.,' cap. lxxviii. (1545); João de Barros, 'Da Asia,' Decada I. liv. III. cap. viii. ff. 32-38 v. (1552); Forla e Soum, 'Asia Portuguesa. Memoria de todas las Annadas,' III, p. 509 (Lisboa, 1675). Peter Osbeck, alias Perkin Warbeck, the supposed Duke of York who rebelled against Henry VII. of England, was in Portugal as page of the Bisagudo (Garcia de Rezende), *Miscellanea*, 1545.

‡ From April 21 to 27. Pero Vaz de Caminha, 'Carta a Elrey D. Manuel,' 1 Maio, 1500, Arch. nac. Torre do Tombo, Gaveta 8, mço 2, No. 8; 'Alguns Doc. Arch.' (1892), pp. 108-121.

§ In the map of Sebastian Münster of 1544, the whole north-east of South America is called America, *sive Insula Brasilia*. I must remind my readers that when Columbus first sighted, in 1499, the South American continent, he considered it as two islands, and called them Isla Santa and Isla de Gracia.

|| On the determination of distances by the fifteenth and beginning of sixteenth century navigators, it is interesting to see Master João telling, in the letter to D. Manuel, how often the differences between the pilots—who reckoned by the nautical chart—and he himself—who observed with the astrolabe—were greater than 150 leagues. In a very important document (1529) for the intelligence of XVth and early XVIth century cartography, the Duke of Bragança shows how, in every ship going to India, all pilots and cosmographers had different reckonings of distances, sometimes as wide apart as 300 leagues. (Torre do Tombo, Gaveta 18, Mço 3, No. 3; 'Alguns Docum.' 1892, p. 493.)

1500, why did the Kings of Portugal not ascertain its truth before? It is precisely what they tried to do in 1498, but could not do then, or could not have done before, as I shall show later on.

Looking for the authentic island on maps made between 1448 and 1600, Mr. Yule Oldham thought he had found it on Behaim's globe of 1492. There appears land (which fulfils the essential conditions of the problem raised by Bianco's map of 1448) represented by an island with an extensive coast-line south-west of Cape Verde. Were the island represented by Behaim located on a modern map, it would occupy, in fact, part of the coast of South America. Given the coincidence between cartographical drawing and geographical reality, Mr. Yule Oldham thought it more rational to suppose that Behaim's island answered to some, at the time, reported information, more or less indefinite, and at present totally unknown, but essentially analogous to that which had guided Bianco in 1448, than to resort to the always ready and easy hazard explanation.

The objection opposed by Sig. C. Errera to this point is worthy of a special comment as typically representative of an historical method extensively employed. Sig. Errera does not dispute the island represented by Behaim having all the essential qualities of Bianco's *authentic island*. He thinks, notwithstanding, that nothing in common exists between the two, since in Behaim's opinion the island of his globe is St. Brandon island. From which it may be inferred that any island, even undoubtedly existent, to which St. Brandon's name might be given (or probably any other of the names to which legendary circumstances have been attached) would become for Sig. Errera a fabulous island. If, instead of having written near the doubtful island the story telling how St. Brandon arrived there in the year 565, Behaim had written this, or any other equivalent legend, next one of the *authentic* Azores, Canary, or Cape Verde islands, Sig. Errera would have doubted its existence. Or if, on the contrary, Behaim had attached neither inscription nor name to the island south-west of Cape Verde, Sig. Errera would have no reason for not accepting it as Bianco's *authentic island*.

As it is, Sig. Errera affirms, without any other explicit reason, that "St. Brandon's island has really nothing"—absolutely nothing, he emphatically insists—"to do with Bianco's island." But this is precisely *quod est demonstrandum*.

Other geographers* thought that, as Bianco saw on maps between 1436 and 1448, the at that time well-known Azores, on the place where cartographers used to draw the Antillia, he had to move the latter southwards (in fact, as far south as the south-west of Cape Verde) rather than accept—what, for my part, I think would be the most natural thing to do—the supposed Antillia and the real Azores as one and the same thing.

Those who employ this argument unconsciously start from the idea that the islands represented on maps were themselves labelled in nature, or had, in nature, their names written on them. Old maps represented an island (no matter under what names) "in the very part of the ocean" on which a real island was one day found and colonized. Would it not be rational, then (in fact, the only rational thing), to suppose that the newly discovered island was the one represented of old? How could Bianco have felt sure that one of the undoubtedly discovered Azores was not the island previously called Antillia, if they both occupied the very same part of the ocean, on his or any other older map? How could the progress of discovery compel Bianco to move the Antillia southwards, as if the name "Azores," or any other given by the Portuguese, could have proved that none of those islands had been previously supposed to exist under the name of Antillia, or as if they had

* *Geographical Journal*, March, 1895, pp. 234, 235.

their names irremediably pasted, or engraved, or sculptured by nature upon them? One of the geographers who opposed Mr. Oldham said that the latter "surely would not maintain that the islands of Antilla or the Seven Cities existed in reality."*

These words show to the full the curious confusion which dominates so many of the historians who have worked out these geographical subjects. As it appears to me perfectly clear that fantastic legends, of which the Atlantic islands have been the object, are one thing, and the real existence of those islands quite another; it is one thing to believe that St. Brendan landed on an Atlantic island in the year 585, or that Christians, escaping from Spain in the year 711, established themselves on this or any other island (which presents no impossibility in its essential elements, but may not have sufficient historical corroboration), and another to believe in the existence of those islands; above all, it is one thing to believe in the decidedly marvellous circumstances which are said to have accompanied or followed those supposed discoveries, and quite another thing to believe that there were already in existence, in the Atlantic Ocean, during the sixth and eighth centuries, islands, some of which at least the Greeks, the Phœnicians, the Carthaginians knew, and the Arabs and more recent nations, in fact, re-discovered there.

Why might Mr. Yule Oldham not believe in the real existence of lands which received the names of Antilla or the Seven Cities, without at the same time feeling bound to believe in the stories told about them?

It was supposed that islands existed on the Atlantic to the west of the coasts of Europe and Africa, long before they undoubtedly began to be frequented or colonized. Now, it so happened that islands were, in fact, found in the Atlantic. Can we doubt their existence?†

For many geographers names seem to be in themselves powerful enough to nullify the existence of the lands to which they are applied, and as soon as they suppose that the *authentic island* of 1448's map might be some land, the old and vague knowledge of which had been represented by the name and legend of St. Brendan or Antilla, they directly decline to believe in its existence, speaking of *changes of places* on the map, as if they were equivalent to *changes of names* in islands—two things, however, entirely different.

Andrea Bianco helped Fra Mauro in the drawing of the well-known map made between 1457 and 1470;‡ still the *authentic island* is not represented on it. But the Azores,§ the occupation of which by the Portuguese Fra Mauro and Bianco could not have been ignorant of at that time, are not represented either. Fra Mauro's map is a systematic representation of the world which entirely obeys theoretical views, essentially the same as those which determined the construction of the ninth map of Bianco's 1486 Atlas. Fra Mauro knew, no doubt, that between the west and east borders of his *orbis* there was a vast sea with, at least, islands, but the existence of the latter had no importance for the conception and delineation of his systematic world. He therefore did not include the Azores or the *authentic island*, which his contributor had represented in 1448, as he did not include, in other places, many other islands, explicitly declaring that he had not room for them.¶

* *Geographical Journal*, March, 1893, pp. 233, 234.

† *Ibid.*, p. 234.

‡ 'Biblioteca Marciana,' Venice.

§ Facsimile, Santarem, Atlas.

¶ "In questo mar [Oltina] sono molte isole la quale non metto per non havere luogo" (Fra Mauro). See facsimile in Santarem, Atlas.

III.

Another great objection to the identification of the *authentic island* with the north-east angle of South America is, for Signor C. Errera, "absolutely invincible" ("assolutamente insuperabile"),* that is, the silence of all Portuguese historians on such a discovery.

Let us now see in what limits this objection must be confined.

It is a fact that the known Portuguese historians do not present any clear reference to land discovered during the fifteenth century, 1500 miles to the south-west of Cape Verde, if we except what, about the map of Pero Vaz da Cunha, the Bachiller João says in his letter to King D. Manuel (year 1500). But by numerous documents, and by the confession of historians themselves, we know that they did not register or relate all the voyages or all the discoveries undoubtedly accomplished in their time.

Who were, in the fifteenth and sixteenth centuries, the Portuguese historians?

Almost all the writers who dealt with any long period of Portuguese history were official chroniclers, charged with the solemn commemoration of the deeds of the princes, and those done under their orders or auspices. The expeditions they mention are merely official expeditions. Their narratives are essentially panegyric. The chronicles of discovery were written by royal command in order to commemorate what, having been only ordered by kings or princes, chroniclers almost always courteously proved to have been actually achieved by kings and princes themselves, each individual king or prince being at the same time shown as the first of all, and the initiator of everything. This is the style naturally imposed by the court on courtiers: such were Gomes Eanes de Azurara, Duarte Pacheco Pereira, João de Barros, and Fernão Lopes de Castanheda.

Antonio Galvão was not an official chronicler. He therefore mentions in his book other expeditions than the Portuguese, as well as some private voyages, less celebrated, and never written of before, which therefore, in course of time, naturally became doubtful, or would already be so, shortly after they were accomplished.

Many even official unsuccessful attempts were, no doubt, omitted by the chroniclers, zealous guardians of the splendour of infallible princes: Azurara mentions that two galleys were said to have passed Cape Bojador without ever returning, even before the first expeditions of the Infante D. Henrique, but he adds that he could not believe it; † and when he has to tell the death of Gonçalo de Cintra, he thinks it necessary to excuse himself for such an extraordinary and unbecoming description, by explaining that it would be an ugly thing not to mention the unfortunate as well as the fortunate occurrences, taking the trouble to quote Cicero to prove that one of the duties of the historian is to write the truth. ‡

Gomes Eanes de Azurara (writing from 1458 to 1466) clearly shows which were the limits and exclusive object of his work, intended to relate the remarkable deeds achieved during the discovery and conquest of Guinea (according to the geographical meaning of this name at the beginning of the fifteenth century), § by order of the Infante D. Henrique, as he (Azurara) was directed to do by King D. Afonso V. of Portugal in 1452. ¶ With other events not related to this special

* *Loc. cit.*, p. 228.

† 'Chronica do Descobrimento e Conquista da Guiné' (Paris, 1841), p. 45.

‡ *Ibid.*, p. 140.

§ "Aqui se começa a crônica na qual são scriptas todellas feitas notaveas que se passaram na conquista da Guiné," etc.—first words of the Paris manuscript after the letter to the king (1452).

¶ 'Chronica do Descob. . . de Guiné,' facsimile. B. 1, v. (1841). Santarém, introd., p. vii; Damião de Góes, 'Chronica . . . do Príncipe D. João,' cap. xl. ff. 3 r-3 (1567).

object, even if they had taken place in the *Infante's* time, Azurara does not concern himself. For all that refers to acts of the *Infante's* life, or done by others under his instructions, or promoted by him, but not immediately connected with Guinea, Azurara directs the reader to the general chronicles of Portugal.* He only speaks of the Canary and Madeira archipelagos, apologising for doing so.† He says himself that he "leaves many things in silence, in order not to divert his . . . writing from what he had promised."‡ The existence of expeditions previous to 1416 is only known from other writers or by documents which Gomes Eanes does not mention. Thus, for instance, nothing is to be found in the 'Chronicle of the Discovery of Guinea,' on the Atlantic explorations under D. João de Castro, in 1416,§ or Gonçalo Velho Cabral in 1416, 1431, and 1432 (1427 or 1427?).¶ And it is João de Barros himself who says that "the Portuguese had in those times discovered more lands than those we find in Gomes Eanes d'Azurara." ¶

It can not, therefore, be said that Azurara "presented . . . a full statement of all the Portuguese expeditions which had been fitted out up to 1448." **

This was the opinion of J. Ferdinand Denis,†† the discoverer of Azurara's manuscript, and has been often repeated since the chronicle was published in 1841,‡‡ but evidently by persons who had not read it or had not completely mastered the subject.

In 1505 King D. Manuel charged Duarte Pacheco Pereira with the detailed study of the coasts of Africa, only in general reconnoitred, in the first discovery, north of the Inlet da Cruz, where Bartholomew Dias had stopped. Although Pacheco enlarged the king's first plan, still he merely refers, in the book he wrote,§§ to Africa,||| and, besides Africa, only to other regions in so far as they could give

* Azurara, 'Chronica do Infante,' etc., p. 3.

† Idem, cap. lxxviii.

‡ Idem, p. 32.

§ Diogo Gomes de Cintrá, 'De Prima Inventione Guineæ. De Insula et Peregrinationibus Lusitanorum.' Manuscript in the Königl. Hof- und Staats-Bibliothek, München. Cod. Chart. No. 553, ff. 270-285 (Cat. 1858), published by Dr. Schmeller, 'Ueber Valentim Fernandes Alentejo,' etc., München [1847], pp. 18, 19. Diogo Gomes is one of the most important and neglected authorities. H. Major ('Life of Prince Henry,' pp. 64, 65, ed. 1868) feels doubtful about some of his statements, as he found him, he says, inaccurate. But the expression of such doubts disappears in the second edition of 1877, p. 33. See 'Arch. des Açores,' xii, pp. 450-452; or E. do Couto, 'Centenário do Infante D. Henrique (Ponta Delgada, 1894), pp. 3-5.

|| Gabriel de Valesque, map of 1499; Martin Behaim, Globe (Nürnberg, 1492); Frutuoso, 'Saudades da Terra,' liv. iii. cap. 12. Manuscript: 'Arch. des Açores,' iv, p. 195.

¶ 'Da Asia,' Doc. I. R. ii. cap. ii., f. 28 (1552).

** Herr Kayserstein, *Geographical Journal*, March, 1895, p. 224.

†† "In fact, it (the 'Chronica da Conquista da Guiné') is a complete history of the primitive discoveries of D. Henrique" ('Chroniques Chevaleresques de l'Espagne et du Portugal,' li. p. 43: 1839).

‡‡ 'Revue de Bibliographie analytique,' ii. p. 503 (Paris, 1841).

§§ 'Remem. do Situ Orbis' (written between 1505-1520). Manuscript of the end of the sixteenth century. Evon. Bibliotheca, Cod. ^{cxv.} 1-3. Published by Sr. Raphael de Azeredo Basto (Lisbon, 1892). This work, for three centuries almost unknown, deserves a special study, which, of course, I cannot now carry out.

|| "It will be enough for us if, omitting all other developments, we only write of those who tell of their navigation to Ethiopia" (Duarte Pacheco, *loc. cit.*, Prologo, p. 1).

knowledge of the road to India. To this an introduction is added, with the "brief mention of some of the great circles [of the sphere] . . . and the relative quantities of land and water in the world." It is in this preliminary part that, when quoting "Vicente Tatarial,"* he says that in the thirteenth century "the existence of a fourth part of the world, beyond the ocean, was already known." To show how careful he was in avoiding dealing with any other lands outside those of his programme, it suffices to say that he does not mention at all the expedition which, under the command of Cabral, reached South America in 1500, and in which, very probably, he (Pacheco) was. It is, however, in this work that is incidentally to be found the following important reference:—

Duarte Pacheco Pereira tells how, in 1498, and therefore immediately after Vasco da Gama's departure on the India voyage (July, 1497), King D. Manuel of Portugal "ordered an expedition to be sent to discover the western parts beyond the width of the ocean sea, where such a great *terra firma*, with so many and large adjacent islands, is to be found. . . ."[†]

The last part of this sentence clearly points to the lands found by Christopher Columbus, this fact precisely strengthening the supposition that the voyage projected by D. Manuel was not to be sent to the objective of the two first (1492 and 1495) trans-Atlantic Spanish explorations, but to the south of them. That voyage did not take place, it seems. The only male son of Fernando and Isabel of Spain having died, their eldest daughter, wife of D. Manuel of Portugal, became heiress to the crown of that kingdom. In April of that very same year, 1498, the King and Queen of Portugal were solemnly sworn at Toledo as successors of the Castilian queen. But in 1498 D. Manuel's wife died; and in the following year of 1499 Vasco da Gama arrived from India. In 1500, however, a fleet, commanded by Pedro Alvarez Cabral, was destined, in all probability, not only to follow up the results of Gama's discoveries, but to try the exploration entrusted two years before to Duarte Pacheco.

Let us now sum up some of the facts I have carefully collected and discussed:—

(a) A map made in 1448 represented an extensive land south-west of Cape Verde, similar in shape to the north-east corner of South America;

(b) There was in Portugal a map, older perhaps, but certainly not more recent, than the middle of the fifteenth century, with an Atlantic land represented south-west of Cape Verde;

(c) In 1498 King D. Manuel plans to send an expedition commanded by Duarte Pacheco Pereira, which was to cross the Atlantic very probably to the south-west of Portugal;

(d) In 1500 the same king, having been prevented from doing it before, sends in fact a fleet, which—without being carried away by any storm, as I shall prove in another place,—arrives at a land (South America) which the cosmographers and pilots recognize as being the same which they had seen marked on the old map (b) which existed in Portugal.

Of João de Barros we only have the work he named 'Asia' (begun in 1535, and

* Fr. Vincentius Belvacensis, 'Speculum Historicum' (Strasbourg, 1472), lib. ii. cap. lxxvii. (Pacheco says, cap. cento e octenta e sete). This is, no doubt, the edition mentioned through a typographical mistake by Sr. Basto as the 1743 edition (notes to Pacheco's 'Esmeraldo').

† 'Esmeraldo de Situ Orbis,' lib. i. cap. ii. p. 7.

‡ Damás de Góes, 'Chronica do . . . Rei D. Manuel Primeira parte,' cap. xxix. ff. 18, 19; cap. xxvi.—xxxii. ff. 22-26 (1566); Jeronymo Osorio, 'De rebus Emmanuelis,' lib. i. ff. 29-30 (1571. Olyssipone).

partially published in 1552). By the word "Africa" the Portuguese then meant, almost exclusively, the north part of this continent, specially the so-called kingdoms of Morocco and Fez, or the "Algarves beyond the Sea." The rest they dealt with in their books under the name of "Asia," not exactly as a section of the latter, but as the road to it.*

Barros speaks of Cabral's voyage to South America because it was an incident of the official expedition to India, adding, "In a fourth part, . . . which . . . is called Santa Cruz, . . . we shall make more particular mention of this arrival of Pedr' Alvarez."†

Nothing, therefore, could have been concluded from Barros's silence on any discovery to the west of Europe or Guinea. But it is the very same Barros who declares that, "Of many who were in the explorations, navigations, and commerce, we cannot give any news, as they did not come where men are made able in honour and name, which place is the king's house; for which omission, therefore, we must be pardoned; moreover, it is true that writers cannot make very particular mention of persons, as writers who much look for them brake History's nerve."‡ Again, in another place he says: "The islands of São Thomé, Anno Bom, and Príncipe were also discovered by King D. Affonso's [V.] order, as well as other places and islands, of which we do not particularly write, as we do not find neither when, nor by which capitães, they were discovered; but we know, by the public voice, that more things were discovered during this king's time,§ than what we have written."||

I have already showed how Antonio Galvão was more independent in writing his work. But nothing leads me to suppose that he knew all the events that had taken place previous to his time. It is safer to build history on what authors tell than on their silence. One passage of Galvão has been quoted as referring to the discovery of Blanco's *authentic island*. Mr. J. Westlake¶ very sensibly observed that "Galvão's story . . . may or may not refer to the same event," which does not, in any way, alter the probabilities of the case. Still it is convenient to correct the quotations taken, not from the original text of this Portuguese historian, but from its translation. After having spoken of a voyage which took place in 1447, but without affirming it to be of the same year, Galvão says of the next voyage he mentions, "It is, moreover, told that in the mean time a Portuguese ship, coming out the Straits of Gibraltar, was carried westwards by a storm much farther than what was contemplated, and arrived at an island where there were 7 cities and people who spoke our language. . . . The master of the ship is said to have brought some sand, which was sold to a jeweller in Lisbon, from which a good quantity of gold was obtained. This having been known by the Infante D. Pedro, who then governed, he had it written in the royal Archives (*Casa do Tesouro*)."

* Manuel de Faria e Sousa, 'Europa, Asia y Africa Portuguesa,' 7 vols. (1678-1681).

† 'Da Asia,' (iv, v. cap. li. f. 56.

‡ Idem., Dec. i. liv. v. cap. x. f. 68. This phrase, revealing the method followed by one of the best official chroniclers who ever existed in any country, should be attentively considered by the modern student, who often unconsciously judges the fifteenth and sixteenth centuries by the light of nineteenth-century customs.

§ D. Affonso V., precisely the king who reigned from 1438 to 1481.

|| 'Da Asia,' Dec. i. liv. ii. cap. li. f. 22 v.

¶ *Geographical Journal*, April, 1895, p. 291.

** 'Tratado que campos o nobre e notavel capitão Antonio Galvão dos divinos e destrayados caminhos por onde nos tempos passados a Placenta e esporaaria reyno de India se nossem partes e assi de todos os Descobrimientos antigos e modernos feitos até á era de 1550,' etc. (Lisbon, 1563), ff. 19 r., 20.

From this literal version, the known and adopted English translation widely differs.

The English translation was published by Hakluyt,* but he is not responsible for it. He says himself, in his *Epistle* to Sir Robert Cecil, that "some honest and well-affected merchant" of England did it. I hope his honesty was greater than his acquaintance with the Portuguese language. In 1862 the Hakluyt Society again published the same translation, this time accompanied by the Portuguese text,† with which, evidently, it was not compared, as it would otherwise have been discovered that, in more than one point, the translation goes as far as to say the contrary of the original.

It is again misled by Hakluyt's translation that Mr. Yale Oldham says, "Galvão goes on to state that he is inclined to believe that the island thus found was Nova Spagua—that is, in the West Indies."‡

Now, Galvão says precisely the contrary, as shown in the following translation from the 1563 text: "And some pretend that these lands and islands, which the Portuguese touched, are those now called Antilhas and New Spain, and advance many reasons to this purpose, which I do not mention because I do not wish to make myself responsible for them, as people used to say of every land they did not know that it was the New Spain."§

Sig. Errera|| also knows, I am afraid, a second-hand Galvão. He says that neither Mr. H. Harrisse¶ nor Herr Kretschmer** knew Galvão's quoted passages. Both, in fact, quote, on the supposed 1447 voyage, the later work of G. Horn,†† who, however, himself quotes Purchas drawn from Galvão (whom he calls "Gavalum").

IV.

To those who consider the silence of historians as a sufficient reason to disprove the reality of voyages and explorations only brought to light by scattered documents, it may be convenient to recall some facts.

No Portuguese historian refers to the expeditions sent by D. Alfonso IV. of Portugal (from before 1336 to 1341), to make discoveries on the Atlantic. As late as the middle of the seventeenth century, Barrois published some Bulls referring to

* Antonio Galvão, 'The discoveries of the world from their first original unto the year . . . 1555,' corrected, quoted, and published by R. Hakluyt. London, 1601.

† Antonio Galvão, 'Discoveries of the World,' etc., reprint, edited by Vice-Admiral Bethune (Hakluyt Society, London, 1862). Although the editor says he has corrected "some omissions and made additions, . . . comparing Hakluyt's version with the original," he modestly admits a "slight and superficial knowledge of the Portuguese language," having charged with the collation of the texts Count de Lavradio, "the gentleman of the Portuguese Legation," and "Chevalier Santos," who evidently did nothing. The first Portuguese edition of Galvão is extremely rare, but exists in the British Museum (C. 32, a). The second of 1731 is also very rare. I happen, however, to have two copies of it.

‡ *Geographical Journal*, March, 1895, p. 229.

§ 'Tratado que compo . . . Antonio Galvão,' etc., f. 20, 1563; p. 24 (1731).

|| *Loc. cit.*, p. 218, note.

¶ 'The Discovery of North America' (London, 1892), p. 656.

** 'Die Entdeckung Amerikas' (Berlin, 1892), p. 108.

†† G. Horn, 'De Originibus Americanis. De Originibus Gentium Americanarum,' lib. I. cap. li. p. 7 (Haga, 1652). Still, Mr. Harrisse often quotes the two rare Portuguese editions of Galvão as well as the English translation of 1601.

them, and a letter of D. Afonso IV.* In 1827 Ciampi discovered, in the Biblioteca Magliabeciana of Florence,† and among Boccardello's manuscripts, some documents proving that one of those expeditions landed on the Canary Islands in 1341.

No Portuguese historian speaks of a navigator called Machico, after whom, probably, a whole district of the island of Madeira was named. As recently as 1894 a unique document revealed for the first time the existence, in 1379, of a Portuguese sailor of that name.‡

Ruy de Pina and Garcia de Rezende, who are the contemporary and fundamental historians of the period between 1481 and 1495 (D. João II.), do not mention in their chronicles§ the name of Bartholomew Dias, nor the voyage of 1482, which was the most decisive of all, the first in which the Cape of Good Hope was reached and passed, opening at last the sea route to India.

At the end of 1491, or beginning of 1492, D. João II. of Portugal sent Pedro de Barcellos and João Fernandes Lavrador to discover lands to the north-west of Europe, the latter's name being, no doubt, the authentic origin of the name of part of North America. They persevered in these explorations up to 1495; and only as recently as 1894 two documents were discovered mentioning them.§

The travels of Dr. Martin (or Martinho) Lopes Sultaria through Europe and Asia, up to the Arctic Sea, Lapland, Norway, and Iceland, in the last part of the fifteenth century are not mentioned by contemporary historians. Some of the documents proving them were only recently published and made known.¶

I have shown how dangerous it is to draw conclusions from the silence of historians. I must now prove the same of the absence of documents.

Often, now, hypercritical historians cancel the assertions of a chronicler, or of a very probable tradition, for want of corroborative documents. "How could that have happened," they exclaim, "without having been mentioned in any contemporary document?" forgetting that, in so doing, they unconsciously start from the false principle, alleged by Sig. Herrera, as I already pointed out in connection with maps, that all documents are still in existence, are well known, have been read, interpreted, and classified.

It is absolutely certain that from 1431 to 1449 seven of the Azores islands were found and occupied by the Portuguese; and still there is no document clearly showing how and when each one of those islands was discovered.

Even after the mention of the Lavrador's name on many maps of the beginning of the sixteenth century, and the reference, apparently decisive, on the map of the Wolfenbüttel Library, the existence of any person of that name was doubtful.

* Odonio Reynoldo, 'Annales ecclésiastiques,' vi. pp. 359-366 (Luce, 1750).

† Sebastian Ciampi, 'Monumenti d'un Manoscritto autografo di Messer Gio. Boccardello da Ostia,' (Firenze, 1827).

‡ J. L. de Brito Rebello, 'Machico. Centenario do Infante D. Henrique,' *Homenagem do Diário da Notícias*, 1894.

§ Ruy de Pina, 'Chronica de . . . D. João II., Coll. de Livros Imp., de Historia Portuguesa,' li. pp. 1-264 (Lisbon, 1792); Garcia de Rezende, 'Lyro das obras de G.,' etc. (Lisbon, 1545).

¶ Ernesto do Couto, 'Quem deu o nome ao Lavrador?' (Ponte Delgada, 1894); and 'Arch. dos Agoria,' xii. pp. 353-371, 523, 530. The existence of both Machico and Lavrador is only brought to our knowledge by documents of an entirely private character.

¶ Arch. na. Torre do Tombo, 'Corpo Chronologico,' part 1. mapa 2, No. 39, published in 'Alguns Doc. Arch.,' 1892, pp. 122-124; Dr. Sousa Viterbo, 'Medicos da Familia Real Portuguesa,' *Jornal da Sociedade das Sciencias Medicas* (Lisbon, 1893), pp. 64-68; Stephen Morse, 'Portugal' (London, 1891), pp. 166, 167.

The loss of the unique document, for such a long time buried in private archives, would be sufficient for Sig. C. Errera and other historians to maintain that, had a man ever seen the land called after him, we should most certainly have the description of his travels and the mention of his name in the documents and histories of the period.*

Azurara's original manuscript and copies of the chronicle of the discovery and conquest of Guinea, were already lost at the beginning of the sixteenth century, and it has only been thoroughly read and used by the students of the nineteenth century.

The original manuscript of Duarte Pacheco Pereira's '*Esmeraldo de situ orbis*,' is even now unknown. The loss of the only sixteenth-century copy extant would represent the total annihilation of the single notice we possess on the interesting official project of exploration towards the south-west in 1488, and historians of geography would then feel themselves authorized to declare, with their characteristic assurance, that such a project had never been conceived.

In reference to the period of Bianco's 1488 map, Ruy de Pina, who succeeded Azurara as official chronicler, and completed or re-wrote D. Alfonso V.'s chronicle, says, "King D. Alfonso's memoirs . . . by neglect or want of writers, were not less forgotten or wasted than his (the king's) flesh and body, which the earth is eating up!"† Of Alfonso de Cerveira, whom Azurara used, nothing was known, even at the time of João de Barros, who says of the sources from which he had to derive his history of the discoveries, "The affairs of the time of D. Alfonso V., as he [Azurara] promised, we did not find: . . . or, if he ever wrote them, they were lost with other writings, which time has consumed. Therefore what we write about King D. Alfonso's time is a mere fragment of this discovery.‡

Those who only read Azurara, and see there the chronological mention of the ships and captains who went out for the purpose of discovery from 1418 to 1448, are led to the supposition that all is to be found in his narrative, and that a minute and methodical registration was made of everything, as if Sagres, Lagos, and Lisbon were all Portugal, and all Portuguese the pilots and servants of Infante D. Henrique.

While discussing Mr. Oldham's memoir, Mr. R. Bassey apparently contested the fact that Portuguese ships were lost, or generalized, from the special case to which he referred, that "the track of every ship was accounted for, and its return to Portugal stated."§

In the middle of the seventeenth century, Faria de Sousa describes the documents he found on the official *armadas*, in the following words: "Of some of the first *armadas* the number of ships is not known, and of some of them the memory was, from the very beginning, lost. The result is that . . . it is impossible to know for certain which ships went and which remained. . . . We did not mention the names of the *náos* and *galeões*, as most of them are not in the memoirs. . . . Up to the present no list has ever been made of the *armadas* that sailed from Lisbon for the discovery of the seas and coasts of Africa and Asia, with the exception of the time of the king D. Manuel, and the year 1497, in which Vasco da Gama went

* C. Errera, *loc. cit.*, pp. 220, 221.

† '*Chronica de D. Alfonso V.*, Prologo a D. Manuel, Coll. Livros med.,' i. (Lisbon, 1790), p. 201.

‡ '*Da Asia*,' Dec. I. liv. II. cap. I. p. 21 v. The italics are mine.

§ '*Geographical Journal*, March, 1893, p. 236. Mr. Yule Oldham rightly said, in answer to this, that he could not "accept the statement." I now show why.

to discover India by sea."* Precisely of the year 1447, to which Mr. Yule Oldham more specially attributes the discovery of the *Authentic Island*, Faria y Sousa writes, as if he were answering Mr. Beazley's unfounded assertion: "Other armadas were sent by Infante D. Henrique, of which neither the number nor the epoch are known."† And, after mentioning the discoveries and armadas of 1498, Faria y Sousa goes on to say, "Previous to this there were other discoveries, of which the authors are unknown, . . . and others which have been forgotten; . . . this neglect and interruption in exploring was also due to the king's (D. Affonso V.'s) wars in Africa and Castille."‡

But Signor O. Errera says too:§ "No argument can possibly explain how the discovery which would have revealed, half a century before Columbus and Cabral, the existence of the South American lands, could have been forgotten."

This sentence leads me to note another of the curious delusions of historians. They unconsciously take for granted that the men who, in the fifteenth century, touched at any point of what we now call America, had the same reasons we have now to fairly estimate the importance of the event.

It would have been, no doubt, unaccountable, had the value of what we now know to be the continent of South America been entirely understood, that the discovery of a part of it should have been forgotten; or that any man, having discovered it, with full consciousness of the importance and consequences of such a deed, could have neglected to present it in all its real magnitude. But nobody could have known before 1448, that any important land found south-west of Cape Verde was part of a vast, rich, and populous new continent. And the argument is seen to be impossible, when those who advance it take the trouble to place themselves in the position of the men of the middle of the fifteenth century. The new land on the 1448 map was represented as an island—one more island—and as such was, no doubt, considered by the person who revealed its existence to Biancho.

The exploration of the Atlantic was very active in the fifteenth century.

The 1436 atlas of the same Biancho proves that, soon after the reconnoitring of at least the first Azores islands, the Portuguese sailed up to the region then, and still, occupied by accumulated seaweeds, and named by Biancho with the Portuguese expression, *Mar de Baga*.|| To quote only the voyage related by Galvão, and attributed by his translators and commentators to the year 1447, gives an impression very different from that produced by the knowledge of the numerous expeditions projected and sent out to the West Atlantic, of some of which we have still authentic documents.

In 1452, Diogo de Teive and Pedro Velasco sailed for more than 150 leagues west of the island of Fayal.¶ In 1457, the Infante D. Fernando planned Atlantic

* Faria y Sousa, 'Memoria de las Armadas. Asia,' iii. p. 523 (Lisbon, 1675). The Italics are mine.

† Idem., p. 527.

‡ Faria y Sousa, *loc. cit.*, p. 519.

§ *Loc. cit.*, p. 224.

|| Everybody knows the amusing explanation of this name given by Formaleiro ('Illustrazione di due Carte Antiche' (Venetia, 1789), p. 48), and adopted by Humboldt ('Examen Critique,' etc., iii. p. 88 (1857)), forgetting that the Portuguese call the Sargassum *resolucas, lagua, "berries."*

¶ Arch. Torre do Tombo, 'Cartas de D. Aff. V.,' 1452, Jan. 8; 'Chancel,' liv. iii. f. 20; 'Alguns Doc.,' etc. (1892), p. 14; Jan. 20, 'Liv. Misens,' f. 69; A. C. de Sousa, 'Hist. Genes. Casa real, Prinas,' iii. p. 500; 'Arch. dos Açores,' l. pp. 9, 10. Mr. Yule Oldham speaks of this voyage on the authority of Fernando Columbus' 'Hi-toins,' p. 22 (1571). Las Casas, 'Hist. de las Indias,' liv. i. esp. xiii. vol. i. p. 100 (1825); Canto, 'Carta Beata,' pp. 30, 36; 'Arch. dos Açores,' l. p. 250.

explorations.* Before 1460, one ship seems to have reached an unknown land no doubt to the west, and possibly to the south-west, where the navigators, fearing the natives, did not remain a long time, coming back to Portugal with news to the *Infante D. Henrique*.† In 1462, Gonçalo Fernandes de Tavira tries to discover new lands to the west-north-west of the Canary and Madeira.‡ In 1473, new attempts are made to discover islands west of the Cape Verde archipelago.§ In the same year, Rui Gonçalves da Câmara goes westwards to look for new lands.|| From 1474 dates the well-known correspondence between Canon Fernando Martins da Roria and Paolo del Pozzo Toscanelli, on the navigation of the Atlantic, and discovery of Asia by the west.¶ In the year 1475 Fernão Telles tries to make discoveries westwards, far from the Guinea sea.** In 1475 Antonio Leme sails to the west.†† In 1480-1481 Thlyde, or Thomas Lyde, or Lloyd, starts from Bristol to the west of Ireland.‡‡ In 1484 Fernão Domingues do Arco intends to look for a reported new island to the west.§§ At the moment of leaving the Canary Islands, on his first voyage of 1492, Columbus remembers having seen in Lisbon this explorer.¶¶ It is about this time (1484) that Columbus offered D. João II. of Portugal to discover the west route to India. From 1486, or earlier, to 1490, one voyage to the west as far as the Sargasso Atlantic region was ordered (or made?) by a Portuguese prince.¶¶ In 1486 the Portuguese expect to find islands and *terras firmes* to the west, and prepare an expedition commanded by Fernão Dulmo, and João Afonso

* Arch. Torre do Tombo, 'Chancel D. Aff. V.,' liv. I. f. 118 v.; 'Alguns Doc.' etc. (1892), p. 22; José de Torres, 'Memor. acerca da Originalidade das Navegações dos Portuguezes.' *Revista dos Açores*, i. p. 290 (1851).

† Las Casas, *loc. cit.*, liv. I. cap. xlii. vol. I. p. 100.

‡ Arch. Torre do Tombo, 'Carta de D. Aff. V.,' 1462, Out. 29; 'Místicos,' ii. f. 153; 'Alguns Doc.' etc. (1892), p. 32; Senha Freitas, 'Memória Histórica . . . de uma supposta Ilha ao norte da Tormeira' (1843), pp. 82, 83.

§ Arch. Torre do Tombo, 'Carta de D. Aff. V.,' (1473), Jan. 12; 'Chancel,' liv. xxiii. f. 23 v.; 'Alguns Doc.' etc. (1892), p. 37.

|| Arch. Torre do Tombo, 'Carta de D. Aff. V.,' 1473, Junho 21; 'Liv. das Ilhas,' f. 1 v.; José de Torres, 'Meia,' etc.; 'Rev. dos Açores'; Couto, 'Os Corte Reais,' pp. 61-63; 'Alguns Doc.' etc. (1892), p. 37.

¶ F. Martins had met Toscanelli in Rome between 1460 and 1464, and talked with him about explorations to the west. See Gustavo Uzielli, 'Paolo del Pozzo Toscanelli' (Firenze, 1892), pp. 91, 212; *Idem*, 'La vita e i tempi di P. del Pozzo Toscanelli-Raccolta di Documenti e Studi. R. Commissione Colombiana' (Roma, 1894), part 7 vol. I. pp. 252, 263, 301, 530.

** Arch. Torre do Tombo, 'Cartas de D. Aff. V.,' 1475, Jan. 28, Nov. 10; 'Chancel D. João II.,' liv. xiv. f. 147, liv. ff. 30, 31; 'Arch. dos Açores,' i. pp. 21, 23, 28; 'Livro das Ilhas,' f. 5 v.; Senha Freitas, 'Mem. histórico' (1843), pp. 77, 78; Couto, 'Os Corte Reais,' pp. 63, 64; 'Alguns Doc.' etc. (1892), pp. 41, 42.

†† Las Casas, *loc. cit.*, lib. I. cap. xlii. vol. I. p. 98 (1875).

‡‡ Cambridge, Corpus Christi College, MS. No. 210, p. 135; 'Itineraria Symonis Simeonis et Wilhelmi de Worcester' (Cantab., 1778), pp. 267, 268; Cornelio Deslaurmont, 'Itinéraire de Giovanni Caboto,' etc. (1881), pp. 10, 45. H. Harrisse, 'Jean et Sébastien Cabot' (Paris, 1882), p. 44; 'Discovery of North America' (1892), p. 659; 'John Cabot the discoverer of North America,' etc. (London, 1890), p. 42.

§§ Arch. Torre do Tombo, 'Carta de D. João II.,' 1484, Junho, 30; 'Chancel,' liv. xiii. f. 84; 'Livro das Ilhas,' f. 19 v.; 'Alguns Doc.' etc. (1892), p. 56.

¶¶ C. Columbus, 'Este es el Primer Viaje,' etc.; Navarrete, 'Colección de los Viajes,' etc., i. p. 6 (Madrid, 1825).

¶¶ Fernandez Duro, 'Colón y Pinzón. Manuscrito de la R. Acad. de Historia,' x. pp. 204-235 (Madrid, 1880); Probanza de 1 Nov. 1492.

do Estreito, whom Martin Behaim is to accompany.* Their first exploration was calculated to last six months, and all the discoveries were to be realized in two years. During the last years of the fifteenth or first years of the sixteenth century (1486-1506) Gaspar Gonçalves Machado, from Ribeira Secca, in the Island of Terceira, tries, during the residence there of Martin Behaim, to discover land north of the Azores.† From 1493 (July 14) dates the letter in which Hieronymus Monestarius (Münchmeister), ignorant of the arrival of Columbus at Lisbon in March of the same year, invites King D. João, II. to reach Asia by the west.‡ From the last months of 1491, or the first of 1492, up to 1495, Pedro de Barcellos and João Fernandes Lavrador undertake, by order of the king of Portugal, several voyages of discovery, exclusively, or principally, to the north-west.§ In 1491, or 1492, begin or continue, with or without the two latter navigators or with one of them, the seven years' explorations from Bristol to which Pedro de Ayala's letter (1498, July 25) to the Spanish monarch refers.|| And all leads to the conclusion that this same João Fernandes Lavrador continues his personal attempts as late as 1499,¶ and accompanies, or guides, in their exploration the Bristol travellers, during the first years of the sixteenth century. With these adventures the first voyages of the Cabots are directly connected. After the return of Columbus in 1493, King D. João, II. is about to send an expedition to the west, commanded by D. Francisco de Almeida.** The two or three expeditions of

* Arch. Torre do Tombo, 'Carta de D. João II.,' 1486, Março 3; 'Chancel,' iv. f. 101 v.; Varahagen, 'Mem. do Inst. Hist. e Geogr.' (Rio de Janeiro, 1842), p. 116, docs. ix.-xi.; Couto, 'Corte Reaes,' p. 66; 'Alguns Docs.' (1892), pp. 59-60; F. Columbus, 'Historia,' etc., cap. ix. f. 22 v.; *Las Casas, las. 66, lib. i. cap. xlii.* vol. i. p. 101 (1875); Carta de Julho, 24; 'Chancel,' iv. f. 101 v.; 'Liv. das Ilhas,' f. 113 v.; Senna Freitas, 'Mem. Hist.' (1843), pp. 62-63; Couto, 'Corte Reaes,' pp. 61-62; 'Alguns Docs.' (1892), pp. 58-61. 'Carta de Agosto,' 4; 'Chancel,' six. f. 87 v.; 'Liv. das Ilhas,' f. 23 v.; Senna Freitas, 'Mem. Hist.' (1843), pp. 69-73; Couto, 'Corte Reaes,' pp. 69-70; 'Alguns Docs.' (1892), pp. 62, 63. 'Contracto de 12 Julho, Chancel,' iv. f. 101 v.; Couto, 'Corte Reaes,' p. 65; 'Alguns Docs.' (1892), pp. 58-60.

† Fructuoso, 'Saudades da Terra,' liv. vi. cap. xxxviii., M.S.; Cordaire, 'Historia insulana,' liv. vi. cap. viii. § 43, vol. ii. p. 329 (1869); Couto, 'Corte Reaes,' p. 95.

‡ Fr. Alvares da Torre, 'Tratado da Sphera do Mundo, tirado do latim em linguagem portugueza com uma carta que um grande doutor allemão mandou a Elrey de Portugal Dom Johana ho segundo,' unique copy in the Royal Library. Innocencio F. da Silva, 'Dictionario bibliographico,' i. p. 51; viii. pp. 52, 53 (Lisbon, 1858-1867); 'Arch. dos Agores,' i. pp. 444-447; Dr. Schmoller, 'Deber Valentin Fernandez Almon' etc., (München), pp. 9-11.

§ Documents of 1490, Oct. 18; 1493, Jan. 30, April 14; 1502, April 14; 1506, Ercasto do Couto; 'Quem deu o nome ao Lavrador,' 1891; 'Arch. dos Agores,' pp. 353-371; Torre do Tombo, 'Carta de D. Manuel, Chancel,' xxxvi. f. 21; 'Arch. dos Agores,' xli. pp. 529-530 (1894).

|| Archivo de Simancas, 'Estado, Tratados con Inglaterra,' legajo 2; G. A. Bergenroth, 'Calendar of Letters, Despatches,' etc., 'England and Spain,' i. p. 177 (1862); H. Harrisse, 'Jean et Sebastian Cabot' (1882), doc. xiii., p. 329, Spanish text.

¶ Arch. Torre do Tombo, 'Carta de D. Manuel,' 1499, Out. 28; 'Liv. das Ilhas,' f. 43 v.; 'Chancel,' xvi. f. 39 v.; Couto, 'Os Cortes Reaes,' p. 78; 'Alguns Docs.' (1892), p. 65. These, as I have shown, are not the "earliest [authorizations to discover] on record for [Portugal]," as Mr. H. Harrisse says in 'John Cabot the Discoverer of North America' (London, 1896), p. 336; and therefore England "was [not] the first nation" (as Mr. Harrisse has it) "which endeavored to follow the example of Spain in the sphere of transatlantic discoveries."

** Ray de Pina, 'Chron. D. João II.,' cap. lxxvi.; 'Coll. Inst.,' li. p. 178; Garcia de Rezende, 'Vida D. João II.,' cap. clxx., pp. 241, 242.

Vicente Dias of Tavira, and of the Cadenas of Seville and Terceira island, to more than 100 leagues west of the Azores, probably date from the last years of the fifteenth century.*

Between 1474 and 1496, João Coelho sails to the south-west, and is supposed to have found desert lands, where he died with all his companions, with the exception of two who managed to come back to Terceira.† Before October, 1495, D. João II. plans to send an expedition to lands that had been seen south-west of the island of Pego (one of the *Das Ilhas* of Bianco's map), in the Cape Verde archipelago, in which direction, as it was known, canoes used to go from the coast of Guinea.‡ And it is certain that before 1500 (probably between 1497 and 1500) Gaspar Corte Real looked for new lands to the west of the Azores.§ In 1500 (before May) João de Ornelas (father-in-law of Diogo de Teive) volunteered to explore the Atlantic for the kings of Spain.|| I will not mention any exploration subsequent to 1500, the year in which, as it is well known, Pinzon and Cabral reached South America.¶

I cannot, therefore, agree with Signor C. Herrera,** that all Portuguese expeditions were directed to the north of Azores, nor that all were destined to look for the Anullia, although, as I profess not to be a victim of the delusion I pointed out,†† I do not attach too much importance to the name under which the navigators looked for, or expected to find, new lands.

This condensed and no doubt incomplete, but still considerable, list certainly does not contain a mention of all that happened; but it gives, I think, a correct impression that during the fifteenth century many in Europe looked for new lands to the west, north-west, and also south-west, some even pretending to have seen them, or to have landed on them. The legendary case of the pilot who is said to have died in Christopher Columbus's house, before the latter's first voyage, has been much discussed. This story, perhaps false in its accessory elements, I consider undoubtedly true in all its essential points; for what is it that tradition (as well as some historians) attributes to the Spanish or Portuguese shipwrecked pilot? That he affirmed to Columbus the existence of lands to the west, adding that he had been there. But this is exactly what Columbus necessarily heard, not from one

* *Las Casas, loc. cit.*, cap. xiii. vol. i. p. 101 (1875); Herrera, '*Historia General de los Reinos*,' etc. (1601), i. caps. ii., iii.; Canto, '*Corte Real*,' p. 60; Harrisse, '*Discovery of North America*' (1892), p. 661.

† Fr. Diogo das Chagas, '*Epellus Chrysotinus em Jardins de varias flores*,' M.S. 1610-1615; Drummond, '*Anuaes da Ilha Terceira*,' l. p. 71; Canto, '*Corte Real*,' p. 72.

‡ C. Columbus, *op. Las Casas, loc. cit.*, cap. cxiii. vol. ii. p. 225 (1875).

§ Arch. Torre do Tombo, '*Carta de D. Manuel*,' 1500, Maio 12; '*Arch. dos Açores*,' iii. f. 400; '*Alguma Doc.*' (1892), pp. 123, 150; Canto, '*Os Corte Reaes*,' p. 35.

|| *Carta de los Reyes*, Arch. Simancas, '*Libro General de endulas*,' No. 4; Navarrete, '*Coll. de los Viajes*,' iii. pp. 41, 42, 77, 78 (Madrid, 1826); A. d'Ornelas, '*Mem. Sobre a residência de Christovam Colombo na Ilha da Madeira*,' p. 7; '*Mem. da Comm. Portuguesa Centen. do Descobrimento d'Amer.*' (Lisboa, 1892).

¶ I have mentioned all the sources, all the documents and archives, as well as the collections and special works where they have been published, principally the Portuguese as being the less known and studied. The two most complete published lists I know of the now existing vestiges of old projected and actually made Atlantic explorations are to be found in Sr. E. do Canto, '*Os Corte Reaes*' (1883), pp. 59-85; and Mr. H. Harrisse, '*Discovery of North America*' (1892), pp. 635-700.

** *Loc. cit.*, p. 221, *note*.

†† See p. 101.

resident of the Atlantic islands, but from many of them.* The list I have just given is, I believe, decisive to prove it. Those who read it cannot fail to be convinced of the possibility, or even probability, of some more or less intentional visit to lands south-west of Cape Verde from which might have been derived the information registered in the 1448's map of Andrea Bianco.

The name of João Vaz da Costa Corte Real (father of the two Corte Reas who, from 1500 to 1502, reached the lands of North America and died there) became surrounded, during the second half of the fifteenth century and the whole of the sixteenth, by an ever-increasing, and in fact legendary, reputation as a navigator and discoverer. Dr. Fructuoso, who is the oldest known chronicler (end of the sixteenth century), referring to it, says that some attributed to João Vaz the discovery of Terceira and São Jorge in the Azores, of the island of Fogo (one of Bianco's *Dois Ermanoës*) in Cabo Verde, the discovery of some parts in the west (*Ponente*), and that of Brazil.† I will not conclude from this quotation more than I can be justified in doing by the most severe criticism, namely, that there was in the sixteenth century a tradition pointing to some Portuguese of the Azores islands having reached South America, or other western parts, across the Atlantic, and that this tradition connected those supposed achievements with the discovery of one of the southernmost islands of the Cape Verde archipelago.

V.

Historians say that Columbus, who both in 1492 and 1494 had started from the Canary islands, went, on his third voyage of 1498, due south-west from the Cape Verde archipelago, in order to ascertain if the King of Portugal was mistaken in affirming that there was *terra firma* in that direction.

Mr. Yule Oldham rightly considers it "strange" that this reason, the most adequate of all to explain the course of the third voyage, "should have been generally overlooked; and still," he continues, "it is as precise and reasonable as could be wished."‡

It is, however, hardly less strange that so many historians should have quoted, on this particular point, as their sole authority, a small sentence of Herrera, and not Las Casas, whom the former had copied.

Now, Herrera was born fifty-one years after Columbus's third voyage, and wrote more than one century after it. To quote him, and only him, naturally

* M. Pinheiro Chagas, 'Las Novelas de los descubrimientos. El Centenario,' No. 17, p. 332 (Madrid, 1892).

† Fructuoso's sentence is, "and some pretend to say that he discovered the island Terceira itself and some parts in the *Ponente* and of Brazil, and Cabo Verde, where he was the first to sight the island of Fogo, and to give notice how it continually threw out fire; and coming from the *Ponente* discovered Terceira itself and São Jorge. . . ."

‡ Soudulow de Terra, MS. lib. v. cap. ix.; B. da Costa, 'Os Corte Reas,' pp. 19, 38, 40 (1833); José Acunado das Neves, 'Considerações politicas e commerciaes sobre os Descobrimientos e Possessões dos Portuguezes na Africa e na Asia' (Lisboa, 1830), p. 36.

§ In a lecture I delivered in London (South Place Ethical Society), December, 1890, I said that "by some it was supposed that João Vaz Corte Real had discovered Newfoundland in 1473." In a Portuguese translation of this lecture in *Opusculo Characteristicas de Portugal na Europa e na Historia da Humanidade, Revista do Portugal*, p. 353 (Porto, 1891), the affirmative of that discovery is incorrectly attributed to me.

¶ *Geographical Journal*, March, 1895, p. 232.

|| Among others, the eminent American expert, Mr. Justin Winsor ('Christopher Columbus' (1890), p. 348.

gives the wrong impression that no historian, contemporary of the event, and personally connected with Columbus, knew the alleged remarkable circumstance. Las Casas is a contemporary, a personal friend of Columbus and of many of his companions. What Las Casas says* is so much more explicit, so much more important and favourable to the hypothesis of Mr. Yule Oldham, that it is incomprehensible how neither he nor any of those who have discussed the subject ever quoted it.

Las Casas evidently writes from Columbus's own reports, probably from his 'Diario' itself,† often copying his own words, as everybody can see in the following sentences, which I translate literally:—

"Here [that is to say, in this point of his narrative] the admiral mentions to the kings [of Castille] the treaty they had made with the King of Portugal, according to which the Portuguese should not pass to the west of the Azores and Cape Verde islands;‡ and also mentions how the kings wished him to be present at the negotiations [1494] together with those who discussed the partition, and how he was prevented from going on account of grave illness. . . . He says, moreover, that soon after [1495] the King D. João died before the said partition could be put in practice."§

This was on June 21, 1498. Of July 1, Las Casas writes—

" . . . The admiral says again that he wants to go south, as he believes . . . he will be able to find islands and lands; . . . and because he wants to see what was the meaning of King D. João of Portugal when he said that there was *terra firma* to the south; and for this reason he [Columbus] says that the King of Portugal had differences [*diferencias*] with the kings of Castille, which were settled when it was decided that the King of Portugal should have 370 leagues to the west, beyond the islands of the Azores and Cape Verde, which belong to him, from north to south, and from one pole to the other; and he [Columbus] says that King D. João considered it certain that inside those limits he was going to find many things and famous lands. Some of the more important inhabitants of that island of Sant' Iago came to see him [Columbus], and said that to the south-west of the island of Fogo, which is one of the said islands of the Cape Verde, . . . an island was seen,|| and that King D. João had a great wish to send an expedition to make discoveries towards the south-west, and that canoes had been known to go from the Guinean coast to the west with merchandize. . . . And [Columbus] ordered the ships to steer south-west, which is the way from those islands [the Cape Verde's] to the austral regions, . . . as he would be thus east-west of Serra Leoa and Cape Santa Anna, in Guinea, under the equinoctial line; . . . and then he would navigate due west, and afterwards to this island Espanola, in which way he would verify the said opinion of King D. João."¶

* Las Casas writes his '*Historia de las Indias*' between 1552 and 1561. It was only published from the autograph manuscripts in 1875.

† *Onus de Lullia*, '*Raccolta di Docum. e studi pub. dalla R. Comm. Colomb. Quart. Cent. del Scop. d'Auen.*', Paris I. vol. I. (1892), p. II.; vol. II. p. XI.

‡ Meaning, of course, the distance determined in the Tordesillas Treaty beyond the latter islands.

§ Las Casas, *loc. cit.*, cap. cxxx. vol. II. p. 223.

|| "Was seen" or "had been seen." This island might have been Biancho's authentic island, already at this time getting confused with the islands seen by mirage. It is, however, not said that the new island was seen from the island of Fogo (one of the *Das Formosa* of Biancho's 1418 map) but to the south-west of it.

¶ Las Casas, *loc. cit.*, cap. cxxxII. vol. II. pp. 225, 226.

From the very words of Columbus, copied by Las Casas, we gather, therefore, the following important facts:—

(a) That during several days, over and over again, Columbus declared he was going to the south-west of the Cape Verde Islands, because King D. João of Portugal believed in the existence of a continental land (*terra firme*) in that direction;

(b) That the reason for the differences between the King of Portugal and the kings of Castille—that is to say, all that preceded and led to the Treaty of Tordesillas—was D. João II.'s belief in the existence of land to the south-west of the Cape Verde Islands;

(c) That the King D. João II. of Portugal considered it certain that inside the 370 leagues west of the Cape Verde Islands, which he accepted at Tordesillas, as the boundary-line, there were very important lands (*terras famosas*);

(d) That King D. João II. (therefore previous to October, 1495), and the inhabitants of the Cape Verde Islands, knew that to the south-west of the island of Fogo (one of the *Das Ilhas* of Bianco's map) one island had been seen;

(e) That King D. João II. had intended to send ships for discovery in that direction.

All this is something more—more trustworthy, more decisive, coming as it does from Columbus himself, in 1498, through Las Casas—than what Herrera shortly says not earlier than the beginning of the eighteenth century. And all this is much more, I think, than that *slight trace* of knowledge of lands to the south-west of the Cape Verde which Sig. C. Herrera determinedly declares the Portuguese did not even possess in the fifteenth century.*

What Columbus knew of D. João II.'s opinions, he probably acquired before 1493. Starting on his third voyage to the south-west, to verify the truth of them, he remembers the fact of his having been unable to be present at the negotiations for the Tordesillas Treaty, as if to regret that, knowing what he knew, he could not have tried to oppose the King of Portugal in the 370 leagues in which the latter supposed important land to be included—an island, *terra firme*, or an island as important as a continent—which would exactly correspond with the *authentic island* represented in Bianco's map, and which, as a matter of fact, was realized by the lands of Brazil.

From this same year of 1498 dates the King of Portugal's project of sending an expedition to the south-west, under Duarte Pacheco Pereira, for the discovery of land represented on an old map, which was in 1500 in Portugal, and might have been there in 1498.

In 1496 D. Manuel reigned in Portugal. What had been done before him, in the time of D. Afonso V. (who reigned when Bianco's map was made), and in that of D. João II., who mentioned to Columbus the existence of south-western lands?

All the information I have here collected and discussed—a great part of which has been so utterly forgotten by historians—seems to me decisive of the great probability of South America having been seen and represented on the 1446 map, and of such a discovery having been more or less distinctly known in Portugal. But I do not suppose that D. João II. was absolutely certain of the existence of that land at the time of the arrival of Columbus from his first voyage, and during the negotiations which culminated in the Tordesillas Treaty; nor do I suppose that his successor, D. Manuel, knew much more than he up to 1500.

It cannot be said—as so many too affirmative historians do—that, had the kings of Portugal any knowledge of the probable existence of land to the south-west

* *Loc. cit.*, p. 212.

of Cape Verde, they no doubt would have sent many expeditions in that direction. Sig. Errera rightly says that "the inquiry after the route to the Cape [of Good Hope] could not have precluded the ambition for other conquests."* This ambition, no doubt, existed, but not the belief that the principal objects in view (the arrival by sea to India, the discovery of the kingdom of *Prestor John*, and immediate commercial advantages) could be attained westwards; nor did the resources of Portugal permit of two important series of expeditions being carried on, at the same time, on a large scale.

And here it is opportune to point out another common fault of the historians of geography: Navigations and geographical discoveries are, to a great extent, unintelligible if we consider them apart from all the other manifestations of national activity. To properly study the history of geographical discovery, all history must be studied. Therefore, only those who study the history of Portugal during the fifteenth century can easily understand why the knowledge of an island could not have determined the Portuguese Government to undertake an official expedition. As soon as King D. Duarte died in 1438, the struggle begins between the widowed queen and the eldest of the *Infantes*, sons of D. João I., for the regency during the minority of D. Afonso V., at that time only six years old. This contest, which impassioned the whole country and keeps it for years on the verge of a war with Spain, lasted till 1449. From 1447 to 1449, precisely when the discovery of the *authentic island* is supposed to have taken place, and when it was certainly drawn on Blanche's map, this civil strife goes through a very acute period. The *Infante* D. Henrique plays in it a very active although mysterious part, and one of rather difficult explanation for those historians who are experts in manufacturing untarnished heroes according to nineteenth-century ethical standards. Under these circumstances, it was possible to keep going, to a certain extent, the routine of the African exploration, but it could not be expected that, at the same time, any explorations should have been fitted out to look for an *island* in the far south-west, no matter how *authentic* its existence might have been considered.

When the more independent will of King D. Afonso V. begins to enter as an important factor in the government of Portugal, his temperament gives to the national enterprises a very peculiar character. D. Afonso V. is not a man of the Renaissance, as his two elder uncles were, and as his son D. João so typically was. D. Afonso V. is the last knight of the Middle Ages; † a kind of mystic Quixote, whose pleasure consisted in the accomplishment of brilliant personal feats and theatrically generous deeds. His activity is, therefore, preferentially employed in the traditional peninsular war against the Barbarous Moors (1457-1471); in fighting out, in the midst of the political indifference of Europe (which was no more that of Godofroi de Bouillon or Saint Louis), a crusade against the Turks, the conquerors of Constantinople and invaders of Italy (1453-1480); in the long war with Spain, to protect the disinherited daughter of King Henrique of Castille, whom D. Afonso V. married, and to conquer her disputed crown—a quarrel which only leaves the battlefield in 1479, and does not end until two years before the king's death.‡ During these two years D. Afonso V. travels in Europe as an easy dupe between Charles the Bold of Burgundy and Louis the Fox of France, abdicates and resumes possession of the throne of Portugal, runs away as a pilgrim to Jerusalem, and at times

* *Loc. cit.*, p. 220.

† J. P. d'Oliveira Martins, 'Os Filhos de D. João I.', pp. 330, 337, and *passim* (Lisboa, 1891).

‡ G. Uzielli, 'La vita e i tempi di P. dal R. Toscanelli. Raccolta di Docum.' etc., pt. v. vol. I. p. 350.

retires from worldly life to live as a monk in the Franciscan monastery of Varamatojo, near Torres Vedras.*

D. João II. was born seven years after Bianco's map was made. He could only have appreciated the importance of the then, probably, already vague account of one more island in the Atlantic, if he ever knew it, more than twenty years after such an island had been sighted or visited. When Columbus returned from his first voyage with the news of having discovered islands in what he supposed to be the sea of Cypango in extreme Eastern Asia, the proceedings of the King of Portugal, if they may give indication of his having had some information of the probable existence of land to the west, were not such as might have been expected from him had any official or other expedition undoubtedly discovered an island of the dimensions and in the position Bianco seems to indicate. Against the Spanish discoveries and consequent pretensions D. João II. only appears to have mentioned "Guinea," and the "seas of Guinea," vague expressions which, no doubt, might include the whole Atlantic, at a time when, even after the discoveries of Columbus, nobody exactly knew what "the Atlantic" really meant.

The negotiations for the Treaty of Tordesillas (1494) are not yet well known, and could not, of course, be discussed now. The Spanish monarchs delayed for a long time their conclusion, and, on a sudden, in three days, two treaties were signed.† We do not clearly know if Portugal then presented claims to the discovery of any specific lands to the south-west of Cape Verde.‡ At Tordesillas we know that to Portugal was assigned, as a boundary for her sphere of dominion, a line drawn at 370 leagues west of these islands. How did Portugal obtain this result? How can it be supposed that, without important reasons, both alleged and more or less proved, Portugal would have been able to gain of a nation much more powerful than she was, 270 leagues beyond the 100 of Alexander VI.'s Bull? To have asked and obtained much more than these 100 leagues, which, in fact, largely covered the at first invoked Guinea Seas, surely proves that Portugal was probably able to

* G. E. d'Azurara e Ruy de Pina, 'Chronica . . . de D. Affonso V., Collec. d'Ind.,' etc. (Lisboa, 1799), l. pp. 193-226; Garcia de Rezende, 'Vida . . . d'Elrey D. João II.' (1545, Lisboa); Damico de Góes, 'Chronica . . . do Principe D. João' (Lisboa, 1567).

† Ruy de Pina, 'Chron. D. João II., Coll. Ind.,' ii. pp. 179, 180; Garcia de Rezende, 'Vida D. João II.,' caps. clxiv. clxv. clxvi, pp. ciii. v. ciii. v.; La Cueva, *loc. cit.*, clxxxiii. vol. ii.; Calvo, 'Le Droit international,' i. p. 24.

‡ One of the geographers who discussed Mr. Yule Oldham's theory says, "We . . . plainly see from De Barros that . . . when the subject of Columbus's discoveries was fully discussed between Spain and Portugal, the Portuguese were unable to produce any evidence of a pre-Columbian discovery of America" (*Geographical Journal*, March, 1895, p. 237). I beg leave to declare that I cannot see anything of the kind: *We do not see in Barros that the Portuguese had produced any special evidence to that point*; but this is not the same as to see that they were unable to do it, or even that they did not actually do it. This argument would only be correct had Barros professed to exhaustively describe the negotiations that prepared the Treaty of Tordesillas, which, of course, he does not. Barros and Azurara are, as a rule, the only Portuguese historians known by geographers. Barros was born two years after the Tordesillas Treaty was signed, and only wrote in 1530. But Ruy de Pina and Garcia de Rezende are contemporaries of the arrival of Columbus in Portugal, and of the consequent negotiations. The first of these was one of the Portuguese envoys to Spain. Pina says how all were satisfied in Portugal with the Treaty of Tordesillas ('Chron. D. João II., Coll. Ind.,' ii. pp. 180), and Rezende specially shows how the king was glad of it, and how he rewarded the Portuguese ambassadors—evidently for what they obtained ('Vida, etc., D. João II.,' exp. clxcl. i. ciii. v.).

produce some good grounds for her claims. Why 370 leagues? Does this special and still unexplained number not seem to point to the probability of the King of Portugal having arrived at its determination from the knowledge of the more or less correct geographical location of lands west of Europe and Africa?

The possibility of the boundary-line passing over land, and that of the existence, not only of islands, but of a continent east of it, was indeed, as Mr. Yule Oldham says,* foreseen by the treaty, although I do not consider this as being enough to show that the boundary-line would certainly pass on lands already known by the Portuguese. The Tordesillas Treaty was the object of many disputes. However, it indisputably gave to Portugal all the eastern part of South America. Were *Biancho's authentic island* at 1500 miles from Cape Verde, the representation of the north-east corner of Brazil, it would have been therefore included in the boundary Portugal claimed and obtained,† for the 370-leagues line passed the mouth of the Maranhão or Amazonas river I at about 48° 35' W. Greenwich.

VI.

But there were, in the fifteenth century, many degrees of determination in what may be called a geographical discovery.

An official navigator might sight an unknown land, disembark on it, completely or extensively study it; and on his return to Europe, describe it to his government and to well-known and prominent men. Such a discovery would probably become famous, and be registered in documents which would have all possible guaranties of sure transmission to future historians. I have, nevertheless, already shown how discoveries, made under these favourable conditions, still remained for centuries in oblivion.

But humble, private, unknown men, ignorant of all the conditions that give credit and celebrity, during a mere commercial exploration, or in the course of a voyage chiefly directed by chance winds, storms, and currents, might also discover unvisited lands. New countries might be approached by crews only able to sight them, or to run along their inaccessible shores, or to reach and land on them without having the means of sufficiently observing and locating them, and might only report afterwards a tale of the adventure to friends, like them, humble and unknown, many, no doubt, naturally sceptical with regard to narratives which, whether true or false, would certainly be abundant in those times.

Biancho's authentic island was probably thus discovered.

As we must not lose sight for a moment of the indisputable fact that in

* Mr. Yule Oldham refers to this clause on the authority of Humboldt (probably in 'Kosmos,' ii. p. 481, 'Anmerkungen,' 1847). The text of the treaty says, "And in case the said . . . from pole to pole . . . shall touch any island or *terra firma*, . . . a sign or tower shall be erected, and signs shall be built along the said line . . ." (V. de Santarem, 'Quadro elem. diplom.' ii. p. 389; Navarrete, 'Coll. de los Vloj.' ii. p. 138; 'Alguns Doc.' (1892), p. 76. The treaty was also published in 1742 in A. C. da Souza, 'Historia genealog. da casa real,' etc., 'Provas,' ii. pp. 91-106).

† A Portuguese historian, recently dead, discussed some question connected with this point in his three last published essays: M. Pinheiro Chagas, 'Os Descobrimentos portugueses e os de Colombo' (Lisboa, 1892); 'O Faleto do Sr. E. de Canto e a Descoberta da America'; 'Jornal do Commercio' (21 and 22 Março, 1891, Lisboa); 'Los Supuestos presenceros de Colon y el Tratado de Tordesillas'; '21. Centenario,' n. 10, pp. 437-443 (1892, Madrid).

‡ Diego Ribeiro draws the line on his map of 1529 a long distance to the west of the mouth of the Maranhão. Ribeiro was a Portuguese, but cosmographer of the king of Spain, and one of their representatives in the negotiations with Portugal.

a map of 1448 an extensive land is represented south-west of Cape Verde, it being, therefore, for me much more rational to admit that the event took place as I have just hypothetically described it, than to suppose that, by mere chance, all the following facts coincided:—

(a) In a map of 1448 appears the sketch of a land (named *authentic island*), the relative position and shape of which essentially corresponds to the north-east point of South America;

(b) At the same time (middle of the fifteenth century or before) a map existed (the same or another) known in Portugal, at least, during the first months of 1500, with land represented in the same position in which, that same year, Brazil was found;

(c) Among numerous explorations and attempts to the west, made during the whole fifteenth century, we have traditions or news of lands found to the south-west of the Azores, and to the west and south-west of the Cape Verde islands, in 1444, or before 1447, in 1473 and 1474;

(d) Before 1486 the King of Portugal supposes the existence of land to the south-west;

(e) This was, in Columbus's opinion, the cause of the differences between the King of Portugal and the Kings of Castile;

(f) Before 1493 an island is supposed to have been seen south-west of the island of Fogo, to which the king intended to send an expedition;

(g) Canoes were, at that time, known to have gone from Guinea to this south-western land;

(h) On a globe of 1492, an island, essentially in the position of this land, and in that of the *authentic island* of the 1448 map, is represented;

(i) In 1498 the King of Portugal actually plans to send an expedition to look for land to the south-west;

(j) In 1500, an expedition of the same king, in fact, finds land—South America—which a cosmographer recognizes as the land represented on the map mentioned in (b); this land, as we can now see, occupying the same position and possessing the same shape as the *authentic island* sketched in 1448.

The greater probability is, therefore, in my opinion, in favour of the supposition that the north-east corner of South America had been seen on or before 1448, although this cannot be affirmed with the same historical certainty with which we can affirm that, in 1492, Columbus landed on some of the Antilles.

It appears to me (if I dare express my whole feeling on the subject) that to answer questions like this with an unconditional affirmative or a rigid negative, is not to realize, in all their true conditions, historical problems—not to realize, in fact, what real life is, and how history ought to be studied and written.

Almost all the historians of geographical discoveries consider it their absolute duty to arrive at a radical conclusion in the study of problematical questions, answering with a *yes* what only deserves a *perhaps*, or, more frequently, dismissing with a *no* what ought to be held as probable.

THE WESTON TAPESTRY MAPS.*

By the REV. W. K. R. BEDFORD, M.A.

WILLIAM SHILLING, of Weston and Brilles in Warwickshire, and Beoley in Worcestershire, was a worthy constituent of that forceful generation which gave us Shakespeare and Bacon, Raleigh and Drake, Willoughby and Camden. He was not

* Paper read at the Royal Geographical Society, December 10, 1896.

content to be like his neighbour Lucy, "a parliament member, a justice of peace," but he sought out for himself some outlet for his energy which should benefit posterity, as well as yield dignity to his own name. He determined to introduce into England the art of tapestry-weaving, and sent to the Low Countries one Richard Hickes, of Barcheston, to study the process, and to bring back workmen to the looms which set up at Weston and Barcheston. What success his project attained I can hardly say, but that the looms were in exercise fifty years after the death of William Sheldon (1570), I shall have occasion to mention; in fact, the tapestry maps are none of them apparently of as early manufacture as his (their founder's) time, although the name of Hickes and the arms of the Sheldon family and its alliances are indisputable evidence of their origin. They are five in number, and their history and description are as follows, three being preserved in the Museum at York, and fragments of the other two (which I imagine to have been the earlier ones) in the Bodleian at Oxford. The Sheldons were strenuous Cavaliers, and injured their estate by their loyalty to King Charles. Successive generations after the Restoration did little to repair the damage, and the mansion at Weston was pulled down about 1774, when Horace Walpole purchased for the sum of thirty guineas ("I have made some purchases at Mr. Sheldon's very cheap indeed," he writes under date of September 12, 1781) the five maps in question.

We have a description of them at this date in Gough's 'British Topography,' 1780: "Three large maps, near 80 feet square, in tapestry, by Francis and Richard Hickes, cover two sides of a gallery at Mr. Sheldon's at Weston, in Long Compton, in this county." The first of which he gives a detailed description is at York, and now before us. It is 18 feet high by 17 feet 3 inches broad, exclusive of a border of 17 inches, which appears to be of later manufacture than the map itself. The north of this map, which contains the county of Warwick, is to the east, and the uppermost name in the north-east corner is Swadlincote, in Derbyshire; on the south-east, Stonesfield, Oxon, is the corner name, and on the south-west Fulbrook and Sudley Castle, Gloucestershire. The recognizable names on the north-west are Hednesford and Sharsill, in Staffordshire, and in that corner are the compass and scale of miles, above which, in the north-west corner, are the Royal arms of England under the house of Tudor, with the garter and supporters, Lion, and Dragon. At the opposite corner, south-east, is a long inscription quoted from Camden's 'Britannia' in a square border adorned with bears (not, as Gough says, boars); and below this on the south-west, the arms of Sheldon with quarterings, impaling Markham also with quarterings.* The date, 1588, is to be upon this map.

The next map mentioned by Gough is also at York, and bears the inscription: "Oxonii et Bercheris comitatus locupletati per Franciscum Hickes." In this the north is, as usual at present, the top of the map, which is 13 feet by 17 feet 9 inches, and has a similar border to the last named, 20 inches wide. This map extends on the north from Bishopcote, Stratford-on-Avon, to Temple Dinsley, Northamptonshire; and on the south from Chipman (Chippenham), Wilts, to Blochingly, Surrey. The arms here are those of Sheldon impaling Savage—argent, six lionsels rampant sable—which apparently carries its date into the seventeenth century, Ralph Sheldon of Beoley, who married Henrietta, daughter of Viscount Rockingham, having been born 1623.

The third map described by Gough is also at York, and, having been unfortunately hung just above a row of casements, is almost obliterated by soot, but the inscription, "Wigornie comitatus locupletata, Richard Hyckes," can be made out,

* Edward Sheldon, son of Ralph, and grandson of William Sheldon, married Eliza-
beth, daughter of Thomas Markham, of Allerton, Nottingham.

and the Sheldon arms without impalement at the top corner left, with opposite to them the arms of the county of Worcester. The dimensions of this are 13 feet 2 inches by 19 feet; and the border 15½ inches. The explanation of our finding these maps on the walls of the Museum at York is this. When Walpole purchased them (in 1780?), he gave them to the then Lord Harcourt, who mentions in one of his letters to Gough his intention to erect a Gothic tower at Nuneham, "on purpose to receive that magnificent mark of the friendship of Mr. Walpole" (1782). These maps became, some twenty-five years later, the property of Edward Venables Vernon (Harcourt), Archbishop of York, who presented them to the Philosophical Society in 1827.

But the maps in the possession of the Bodleian, though sadly mutilated, are still more interesting. It is probable that this mutilation commenced at an early period, for Gough (1780) speaks of a piece of a fourth map about 5 feet square "shown for the freshness of its colours and beauty of a bear, and other emblematical figures upon its border," and says that it includes the east part of Surrey, and has the Sheldon quarterings with the motto, "*Optimum pati*." This fragment was sold, mounted as a screen, at the Strawberry Hill sale in 1842, seventeenth day, No. 59, to Strong of Bristol, for 12 guineas. "On one side a coat of arms, with a wild boar beneath; on the other, a map of part of the counties of Surrey and Middlesex; and Anthony and Cleopatra (Hercules and Omphale) beneath." Nor was this the only peculation. Mr. D. P. writes from Stuaris Lodge, Malvern Walls, June 26, 1860, to *Notes and Queries*, that in 1861-65 he "was offered at a shop in Davies Street, Berkeley Square, left-hand going north, a piece of a Sheldon map, representing west of Gloucestershire, for which he was asked £5."

The Sloane Street Decorative Needlework Society have them under repair this year. The first of the two Bodleian Maps (12 feet by 15 feet) is inscribed "Wigorn: Coml: Locupletata Ric: Hyckes;" and the "Scala Millarum," south-west corner, gives 3 inches to the mile. A border of 21 inches has been cut off the north and north-east. At the west top corner is this inscription—

"On this side whiche the same doth warne, With his declining beames.
Severn and Teme in channell deepe Doo run, too ancient stremes
Thes make the neighbor's pasture ripe. Thes yeld of fruit great store.
And do convey thro out the shire commodities many more."

Just below this a piece has been cut away across the whole map (from 20 to 24 inches wide) mutilating a figure of Judith with the head of Holofernes; in the border just below which is the word *Occidens*, and another inscription in panel—

"Here hills do lift their heads aloft, From whence sweet springes doo flow,
Whose moistur good doth still make The vallies coucht belowe,
Here goodly orchards planted are In fruits which doo abounde,
Thine ey wold make thin hart rejoyce To see such pleasant grounde."

At the south-west corner of the border are figures of Hercules and the Hydra under a canopy, and with Vases, Caryatides, and allegorical figures, another inscription between two human figures (one with a sphere and another with globe and compass), the word *Meridies* and—

"This southly part which hear below towards Gloucester fall
Of corne and grasse growt plenty yelde, but fruite exceedeth all."

Near this, however, a piece about 3 feet wide of the map, besides the border, has been cut away; as have the royal arms at the top, only leaving the heads of the supporters, lion and dragon, in use at the time of the Tudors.

The map has contained the whole of the counties of Worcester and Warwick, with as much of the adjoining shires as would complete the square. It is executed in colours, which have retained their freshness surprisingly, giving a kind of bird's-eye view of the country. At Hereford, for example, there is a careful distinction between the arched stone bridge over the Wye and the wooden tresselled bridge at *Faenhope* and *Hamclayce*. All the villages are named, and many of the manor-houses (the park palings being all rendered), e.g. *The Bache*, *The Golden Vale*, *Dorton Castle*; on a hill near *Kinaston Chapel* this inscription, "Whych was driven down by the removing of the ground."

The Vale of *Eveshalme* is thus lettered, and the village of *Brodway* with its beacon. The *Rullright* stones are marked (seventeen in number), and many roads are indicated—notably, the *Rudgway* near *Aleceder*. The rivers are blue, the borders of the county of Worcester red.

Still more interesting is the remaining map—the original, as I am inclined to think, of the second map I have described at York—and containing the valley of the Thames, and the counties of Oxford and Berkshire. Very large pieces have been cut away from its original surface of 12 feet 6 inches by 18 feet, and very little of the ornamental border is left, although, from a fragment representing two horses' heads (one biting the body of a man), it may be conjectured that among the various subjects represented were, as in the former map, the exploits of Hercules. More to be lamented is the fact that a small map of Africa at the centre of the lower border has been nearly all torn away, though the *Cape de Bona Speranza* and the island of Madagascar are distinct. Small pieces of celestial and terrestrial globes are still existent in the upper border.

Very little of the northern part of this map has escaped destruction. Fortunately, Oxford is spared, and with its castle on the mound, its spires and river, makes an interesting picture. A mutilated inscription recorded Camden's account of the "sixteen colleges and eight halls, with rich endowment of persons of all men without envy," to which is appended "*Descriptio Willielmus Camdenus—Trausulit Willielmus . . .*" the other name is missing, but possibly was *Sheldonus*.

Kington Lisle and the *White Horse* are plainly to be seen in the lower part of the map, and the course of the Thames from Windsor to London Bridge.

The piece containing London is 18 by 36 inches, and is evidently on the same scale as that of the former map, viz. 3 inches to the mile. It went to the eastwards no farther than the piece now preserved, but we can see below how the portion has been cut away which Walpole made into a screen.

What now remains gives the Thames from London Bridge, with its houses, to Brentford (spelt *Brainford* in the map). Westminster and its palace, Lambeth and the archbishop's gateway, the village of St. Giles, the windmills on Hampstead Hill, are all portrayed with picturesque fidelity, as are the parks at Kensington and St. John's Wood. The course of the Brent is plainly marked, with the villages on its banks, and the old turretted house at Osterley (spelt *Osterley* in the map). Hizat, Hakeney, and Wilsdon are other noticeable names.

We now come to the most interesting question, From what survey were these maps taken, embracing the whole of the midland counties of England?—Worcestershire, Warwickshire, Oxfordshire, and Berkshire; with parts of Stafford, Derby, Leicester, Cambridge, Bedford, Hertford; nearly all Middlesex, Surrey, Buckingham and Northampton, Gloucester and Hereford; portions of Wiltshire, Hampshire, and Shropshire. Gough has noticed that certain inaccuracies of spelling in the names of places represented in the maps are precisely the same as those in Saxton's maps. He also observes that the figure of the compass in one of them exactly resembles

that in Saxton's map of Kent. The spelling, he admits, savours of Flemish artists, and the Orientation of the North in the map at York, which I described first, was also a prevalent habit with Dutch geographers. Still, I venture to adhere to his opinion that they were founded upon Saxton's survey, though the scale is so much larger, and the detail in many cases so minute and particular, that it is impossible to resist the conviction that personal observation played an important part in their formation. I noticed, in parts of the country with which I was well acquainted, that the churches were not represented by a uniform and conventional pattern, but that some had spires on their towers and others not—correctly agreeing with their present-day condition. I might instance many other proofs of personal knowledge on the part of the maker of the maps, and, could only the cartoons be discovered, it would be beyond doubt.

I believe that the actual credit of the maps will be found to rest with Francis Hicks, of Barcheston, son of the weaver Richard. He entered Oxford as a member of St. Mary's Hall, and studied at Oriel College, but did not graduate. From Wood's account he was a man of culture, and left divers historical works; one of which, at any rate, was published by his son, Thomas Hicks, M.A., chaplain of Christ Church, 'Certain Select Dialogues of Lucian, together with his True History.' He spent his life in the neighbourhood of Shipton-on-Stour, and died in 1630, at Sutton-under-Brallies, where he was buried. I trust that the counties thus early and picturesquely delineated will combine to have facsimiles of these most interesting documents preserved.

Before the reading of the paper, the President said: This being the first afternoon meeting of the session, I will take the opportunity of announcing the subjects of those which are to follow: On "Sand-dunes," by Mr. Vaughan Cornish; on "History and Geography," by Mr. Andrews; on "Distribution of Earthquakes in Japan," by Mr. Davison; and on the "Magnetic Pole," by Mr. Reeves. This afternoon Mr. Bedford will give us the history of five tapestry maps of the inland counties, worked in the sixteenth century, one of which has been kindly lent to us by the York Philosophical Society, and is now before you. I will now call upon Mr. Bedford to read his paper.

After the reading of the paper, the President said: I am sure that we have all listened with great interest to Mr. Bedford's account of these tapestry maps, and that we appreciate the trouble and research he has devoted to the elucidation of their history. From a geographical point of view, I think that the most interesting part of the subject to which Mr. Bedford has alluded, is the question respecting the survey on which the tapestry maps are based. I agree with him that the tapestry maps and the maps of counties forming Saxton's atlas were, in all probability, based on the same survey; but we should like to know more about it. Saxton's beautifully engraved maps were published in 1579, and the date of the tapestry map before us is 1588. We have a few details of the life of Saxton, and we know the name of his principal patron. We are also told that he was occupied for nine years in making the survey of England, on which his maps were based. I cannot help thinking that it must have taken a much longer time, unless he had numerous assistants. The discovery of the original surveys would be of great geographical interest, nor do I think that such a discovery is beyond hope, for I find, from Ralph Thoresby's diary, that, in June, 1710, he rode to Sir Henry Goodrick's house at Ribston, and saw there "the autograph and some original surveys of Christopher Saxton's."

It would be a worthy undertaking for a young geographer, who also has a taste for antiquarian research, to give us a history of the maps of England, or, better still,

of Great Britain and Ireland, from the earliest times to the commencement of the Ordnance Survey. I have no doubt that he would throw more light on the surveys upon which the Saxton atlas and the tapestry maps were based, as well as upon many other points of geographical interest.

Meanwhile, we have had a grand instalment of such information this afternoon. It remains for us to pass a hearty and most cordial vote of thanks to the York Philosophical Society for the kindness of its council in lending us this most interesting map; and to Mr. Bedford for his ably conducted researches, and for the paper to which we have all listened with so much pleasure.

JOURNEY OF CAPTAIN WELLBY AND LIEUT. MALCOLM ACROSS TIBET.*

(The following account of a journey from Leh to Peking across Tibet and China is taken from a letter of Lieut. Malcolm's, which has been kindly placed at our disposal by his father, Colonel E. D. Malcolm, c.n.)

We sent our caravan ahead of us from Leh, and followed it on May 4, catching it up at Shushai, whence we intended to cross the frontier by the Lanak-La, as Bower did. Finding, however, that a pass called the Marsoonik-La (18,300 feet) was still closed by snow, we had to take a rather circuitous route and cross the Wapu-La (18,434 feet). Unluckily, the Tibetan officials at Rudok had heard of us, and came post haste to stop us; so, finding that neither persuasion nor threats had any effect, there was nothing for it but to retrace our steps across the pass. The Tibetans gave us guides to show us the way to the east side of the Lanak-La (our frontier), and there we arrived on May 30. That night our guides disappeared, so that we were left to find our way across Tibet without any. On June 1 we started, and went on all that month, going east whenever possible, and when not, going north in preference to south. This took us through very barren, grassless country, with many salt lakes, but very little fresh water. Nearly every day until well on into July we had to dig for water for ourselves and our animals, and frequently the latter had to go without. By the end of June only sixteen out of thirty-nine mules and ponies were left, and we had to give up riding, our ponies having died. The heat in June and July was great, and instead of being nearly frozen, as we had expected, it was the sun that troubled us, although it was cold enough at night. Once in June there were 18° of frost at night, and the thermometer in the sun went up to 105° about midday.

Until the beginning of August we made good progress and had no difficulty in finding a road, but the men were getting more and more lazy and insolent, thinking that we were in their power. On August 2 they went off in a body, taking with them our last 20 lbs. of flour, and we were now left with the native assistant-surveyor, our body-servant, and the cook. The latter was busy when the others left, or he too would have gone off, but as it was he stuck to us and proved invaluable. We quickly loaded up, and made our march as usual. That night we had to watch by turns, in case the men should try to steal the animals. After following us for two days, they begged to be taken back; but we took only the best of the lot, as we thought that another time they would probably go off with the animals. The men had made up their minds, some two months before, to leave us as soon as their food was run out, and make for Lham. On the 10th we had to halt at the top of a very high pass, with neither wood nor grass, as the animals

* For this and the following communication reference may be made to the map of Tibet, *Gerg. Journal*, vol. iv. p. 96, and to Mr. Littlehale's map, vol. vii. p. 376.

were exhausted with the long pull uphill. Seven mules and two ponies died during the night from eating a poisonous weed, and we were reduced to three mules, fortunately good ones. We were obliged to throw away everything not absolutely necessary, and could now move only very slowly, as the loads were heavy and the ground very bad, especially as it rained or snowed nearly every day. Game became very scarce, but we ate quantities of wild onions, which we found growing in enormous beds. So we went on, following down a river to a big lake; then to the source of another river and down it until September 6 without seeing a man. Matters were looking serious, but on that date we made out some tents on the far side of the river and sent over two men to make inquiries. They did not return until the next day, but then brought the welcome news that the tents belonged to a merchant from Lhasa, going with cloth and dried dates to China. Some smaller merchants were with him, making up a caravan of perhaps 1500 baggage animals (*yaks*). It was agreed that we should travel in company. The road here left the river and went north across the mountains, so that had we come a day sooner and not met this merchant, we should have missed it. From him we got supplies of *tambs*, flour, salt, butter, etc., but had to pay a fearful price. We stayed with the merchant eight days, and learnt that the river on which we had met him was the Chumar, the main source of the Yang-tse.* This news pleased us greatly, as our principal idea at starting was to find the source of this river, previously unknown.

We now decided to leave the merchant, and make for Barong, in Tsaidam. We did not strike that place itself, but got to a Mongol encampment, where we were very kindly treated. We hired ten ponies to take us fifteen days' journey into China, our road lying along the north shore of the Koko-Nor. The weather, though getting cold, was lovely. We slept on the ground in the open, although one night there were 27° of frost, and generally about 20°. On October 15 we arrived at Tankar, the frontier town of China in this direction, where we found a Mr. Rijnhart, a Dutch missionary, who, with his wife, hopes to work his way slowly to Lhasa, making friends with the people en route. From Tankar our baggage went to Sining, where there are English missionaries, we ourselves going a longer road with Rijnhart by Kumbum, where there is a very famous Buddhist monastery.† By the courtesy of Mesia Fuyeh, a Buddha in his twenty-second incarnation, we were allowed to see over the whole place. From Sining we went in four days to Lauchau, the capital of Kansu, doing the last 22 miles on a small raft made of boughs supported on inflated skins.

[The journey hence to Peking was made by boat down the Hoang-ho to Pao T'ao, and thence by road along the northern border of China.]

A letter just received from Captain Welby adds a few details respecting the route to those given in the above account. During the greater part of the journey across Tibet, the travellers kept between 35° and 36° of north latitude. Their route was, therefore, far to the north of Captain Bower's (which kept for the most part south of 34°), and must have nearly bisected the largest hitherto unknown

* This is apparently the Ma Chu, or Red river, of A—K (*Proceedings R.G.S.*, 1885, p. 70), which is given by him as one of the head streams of the Yang-tse. The northern tributary of the Upper Yang-tse, known to the Mongols as Napekbal-nun (naren), is also called in Tibetan Chu Ma, or Ma Chu. If the former Ma Chu be the river struck by the travellers, the lake above referred to may possibly be the Lac Montcalm of Bourdrel. It may be noted that Mr. Rockhill passed very close to the supposed sources of the Dri-chu (Di-chu or Upper Yang-tse) in 1892.

† A photograph of this monastery appears in Rockhill's *Diary* (1894), p. 20.

area in Tibet. The main sources of the Yang-tse have, however, been generally considered to lie between 38° and 25° N. After leaving the Tibetan merchant, the travellers crossed the S'unga Gol, over the Namoran Dawan to Koko Nor. Through Tibet plane-table work was carried out by the Indian surveyor, whilst latitudes were taken with the theodolite and sextant, and altitudes and temperatures were recorded. Photographs were also taken with a Kodak. Some eighty species of plants were collected, and are being sent by Captain Wellby to the Society.

CAPTAIN DEASY'S JOURNEY IN WESTERN TIBET.

[THE following communication, dated "Simla, January 2," has been received from Captain H. H. P. Deasy, 16th Queen's Lancers.]

Accompanied by my friend Mr. Arnold Pike, I left Leh on May 27, 1896, and our caravan of sixty-six mules and ponies and fifty baggage sheep joined us at Fobrang, where we got the remainder of our supplies. Fobrang is the last village on the road from the Pangkong lake to the Lanak La, a high but easy pass leading into Tibet. Our route was *eid* Mangtra Cho, north of Herpa Cho, to Yeshil Kul, where we were obliged to halt for over a week on account of fever and illness brought on by exposure. Thence we went almost due east till we struck a country that for several marches appeared to be barren and waterless, nearly due north of Aru Cho; so we were obliged to retrace our steps. On the edge of this most inhospitable-looking country thousands of antelope were seen, and there could not have been less than 15,000 in view at one time—a wonderful sight, which I never expect to see again. We then turned south, crossing Bower's route on the west side of Aru Cho, and went slightly east of south to about lat. $32^{\circ} 35'$ N., long. $82^{\circ} 40'$ E.; thence in a westerly direction for about 40 miles, and then north to about lat. $33^{\circ} 40'$ N. From this place we steered towards the south-west corner of Charol Cho, and thence by zigzag marches west till we entered British territory close to the north-west corner of the Pangkong lake on November 4, having explored over 700 miles in Western Tibet.

Only six animals lived to return to Leh, the casualties having amounted to sixty. By the time we reached the south of Aru Cho we had lost many animals, chiefly from their being overworked; but the climax was reached a few marches farther on, when nine of the best were stolen. While we halted to explore the country for many miles round for the missing animals, four more died. We now had to abandon two tents and everything that was not absolutely necessary, load the remaining animals very heavily, and go by short marches towards where we thought inhabitants might be found. As we had no guides since crossing the Lanak La, the search for natives was made much harder. Our situation was now most serious; all the animals were heavily laden and very weak, while many had bad sores. To retrace our steps would be fatal; the country we were in was represented on the map by a blank space. However, we eventually met some Tibetans on September 5, but it was impossible to procure fresh transport at any price until we had turned towards Ladakh. We were then allowed to purchase at high prices some aged ponies, and were provided with a guide and a few ponies gratis. I was most anxious not to return direct to Leh, and fortunately was able to keep, roughly speaking, parallel to and about 40 miles distant from our outward route until close to Charol Cho, thus enabling me to survey almost all the country between the outward and the homeward tracks.

The weather during the last couple of weeks was most trying, especially on baggage-animals, many of which, although for weeks unladen, died or had to be shot.

Strong cold winds which blew almost daily, and sometimes at night too, rendered surveying most trying work, and necessitated constant reliefs when taking angles from the tops of the lowest mountains which commanded good views of the neighbouring country. I was well supplied with instruments, a fine 6-inch transit theodolite by Troughton & Simms, and a portable mercurial barometer of entirely new design, which was made partly by Casella especially for me, forming part of my scientific equipment. The extent of country surveyed exceeds 23,000 square miles, while the heights and positions of over 250 peaks were fixed trigonometrically. I did not rely on watches to fix the longitude of each camp, as triangulation was successfully kept up from start to finish, when the surveying was closed on two peaks which had been fixed by the survey of India. Bad weather prevented me on many occasions from taking absolute observations for longitude, which was a great disappointment to me, as for the last couple of years I had taken great pains to make myself thoroughly *au fait* in this branch of astronomy. However, I observed three occultations, but only on one night for longitude by moon culminating stars. Heights were determined by mercurial barometer, which was read twice daily to 0·001 of an inch and by hypsometer, for which I had four thermometers, two of which were used as standards with which those in daily use were occasionally compared. At almost every camp observations for latitude, time, and azimuth were taken, as well as over 200 observations, during the whole expedition, to determine the variation of the compass. The botanical and natural history collections were, I regret to say, small, but almost every kind of grass and flower seen was collected, mainly by Mr. Pike, to whom I am greatly indebted for the valuable assistance he gave me in many ways, thus leaving me free to devote all my time to surveying, taking and computing observations.

MAP OF THE NIGER DELTA.*

In connection with the sad disaster which has recently occurred in Benin, we publish a map of the delta of the Niger. It is chiefly a reduction from documents in the possession of the Royal Niger Company, kindly lent to the Royal Geographical Society. Some additions have also been made from the map recently published by the Intelligence Department, War Office. The part between Wari and Sapelo has been taken from a route-survey by the late Major Copland Crawford, made January, 1898. Reference may be made to the paper by Captain Galloway in the *Journal*, vol. i. p. 122, and to a note on Major Copland Crawford's journey, vol. vii. p. 661.

THE MONTHLY RECORD.

THE SOCIETY.

Index to the Proceedings.—A general index to the fourteen volumes of the *Proceedings* (new series) for the years 1879-1892 has been prepared under the supervision of Mr. E. Heawood, and is now ready to be issued. It is compiled from the annual indexes, but the arrangement has been improved and simplified, so that the bulk only amounts to

* Map, p. 248.

250 pages, in place of the 600 pages occupied by the fourteen separate indexes. A classified index of the papers in the *Proceedings* is first given, arranged under the various continents and departments of geography, and then subdivided. This is followed by a similar index of the maps published in the *Proceedings*, and a third dealing with the illustrations, the whole of this introductory part occupying 20 pages. Then follows the general index in alphabetic order, with a special sign to indicate the titles of independent articles or notes of some length, and another to designate notices of new publications. The entries not so marked refer either to very short notes or to mere references in articles. This will, it is believed, greatly facilitate reference, and increase the utility of the work.

Christmas Lecture.—A "Christmas Lecture" to young people was given in the hall of the Alpine Club on the afternoon of January 1, by Dr. H. R. Mill, the subject being, "In Search of an Eclipse—the Coast of Norway." The lecturer described the west and north coasts of Norway as seen by him on one of the expeditions to the Varanger fjord in August last, illustrating his remarks by means of a series of maps and views. The photographs were taken with the object of producing geographical pictures which should exhibit the most characteristic features of the scenery and people. They were exhibited side by side with the maps on two parallel screens, so that the route could be followed on one while its scenery was shown on the other. Attention was first called to the line of small rocky islands which form a natural breakwater along the coast of Norway, thus leaving a narrow channel of smooth water along the coast, and to the Gulf Stream drift, which ensures a climate mild enough in winter to prevent this great line of communication from freezing. The gradual change of climate from south to north was shown by views of the vegetation, from the magnificent woods of the Romsdal fjord to the dwarf forests and rich meadows of the Lofotens, and the bare mosses of the north shore of the Varanger fjord. Attention was called to the devices for drying hay and grain on hurdles and stakes, which were compared with the similar structures in use in the valleys of the Alps. The change of the people from the Norwegians of the south and the coast towns to the Lapps and Finns of the north was also brought out. The influence of the long arctic night in leading to the introduction of the electric light in towns so small and remote as Hammerfest was indicated; and the close bond between this outlying islet and the rest of Europe was emphasized by a view of the meridianst tte, a pillar erected at Hammerfest to mark the end of a chain of triangulation extending from the mouth of the Danube. Pictures of buildings, carriages, ships, fishing-operations, and whale-boiling, were shown and explained. Finally, the preparations for observing the eclipse by the astronomers assembled at Vads  were described, and the last two contrasted views showed a corona such as

the astronomers hoped to see, and the cloudy sky which actually greeted their eyes at the critical moment. The lecture was well attended, over two hundred tickets having been taken.

ASIA.

Journeys of M. Chaffanjon and M. Bonin in the Chinese Empire.—Letters from M. Chaffanjon, describing the latter part of his journey across Northern Asia (*Journal*, vol. vii. p. 560) are published in the *Comptes Rendus* of the Paris Geographical Society, 1896, p. 326. From Urga to Taitshikar the traveller had carried out a survey by Khaliar (east of Dalai-nor) and across the Khingan mountains, the result of which will be seriously to modify the existing maps of the region. He had also made numerous observations on the Mongol tribes, as well as collections of zoological specimens. The unusual amount of rain which had fallen in the Sungari basin, and which had converted the whole country between Han-chao and Sen-seu into a huge marsh, necessitated a change of route beyond Taitshikar, and M. Chaffanjon had proceeded by the northerly road *via* Biagoveshchensk, to which point he had continued his survey. He then reached Vladivostok by the navigable part of the lower Amur. Much damage had been done by the inundations, portions of the railway between Vladivostok and Khabarovsk being destroyed. M. Bonin, whose explorations on the Upper Yang-tse were referred to in the *Journal*, vol. viii. p. 515, has continued his journey across the Gobi to Urga, whence he hoped to proceed to Peking (*Comptes Rendus S.G. Paris*, p. 298). M. Chaffanjon returned to Paris in December.

Journey of M. Madrolle in Tongking and China.—According to the *Comptes Rendus* of the Paris Geographical Society (1896, p. 321), M. C. Madrolle has lately made a journey from Tongking up the Red river, and across the mountains to Yunnan-fu. Thence he crossed the southern bend of the Yang-tse, and proceeded through the mountainous Lolo country, in the depth of winter, to Taitshien-fu, whence he reached the sea *via* Chongtu and the Yang-tse. He subsequently explored the Isle of Hainan, where he studied the natives and constructed a map. He saw many traces of minerals, including copper, argentiferous lead, gold, and tin.

Crossing of Borneo.—The journey referred to on p. 89 of the January number of the *Journal* has been successfully accomplished. Dr. Nieuwenhuis, after ascending the Kapuas as high as possible, crossed the waterparting to the Pennae, and descended that river into the Mahakkam, which he followed to its mouth. This last river was ascended by G. Muller in 1825, but he was murdered on its upper course, and all his notes were lost.—*Petermanns Mittheilungen*, December, 1896.

AFRICA.

Lieut. Hourat's Voyage down the Niger.—The members of Lieut. Hourat's expedition were accorded an enthusiastic reception on the part of the Paris Geographical Society on January 15, a special meeting being held in the Sorbonne in their honour. Pending the publication of Lieut. Hourat's full report of the journey, the following details, supplementing those previously made known, have been given in the January number of the *Bulletin du Comité de l'Afrique Française*, accompanied by a map. The expedition left Kabon, the port of Timbuktu, on January 23, 1896, with three boats, one of them constructed in sections. After passing Rheiga—a village more ancient than Timbuktu, which, until partially destroyed by the Hoggar, promised to become a centre of commerce between the countries within the bend of the Niger and those on its left bank—the voyagers

encountered much opposition on the part of the fanatical marabouts who hold the country. However, on giving himself out to be the nephew of Iarth, as recommended by an influential native of Timbuktu before starting on the journey, M. Haurat found the hostile attitude at once abandoned. The chief of Tosal offered to introduce the travellers to the chief of the Awellimiden, whose hostility was much to be feared. Bands of hostile natives had already appeared on the bank, and seemed inclined to contest the passage of the strait where the river narrows to little over one hundred yards. However, it was passed without danger, either from the stream itself or from the natives, and the town of Gao was reached on March 4. Madidu, chief of the Awellimiden, entered into friendly relations with the strangers on being assured of their pacific intentions. On the 14th rapids began to cause difficulties, necessitating the unloading of the *Jules Davoust*. The river did not finally regain its smooth appearance until within a short distance of Say. This town had a population of about two thousand men during the stay of the expedition. Ahmadu, the old enemy of the French, was attempting to reconstitute an extensive dominion in these parts, and the chief of Say was his devoted adherent; so that the voyagers met with sullen opposition. Leaving Say on September 15, a more friendly population was soon reached. The rapids of Bussa caused some trouble, owing to the refusal of the chiefs to supply guides, but were at last successfully passed, and the last difficulties of navigation were surmounted. The first British post was reached at Leba, just below the rapids, which is occupied by a force of twenty men. The rest of the voyage was without important incidents, and the exit from the river was made by way of the Niger Coast Protectorate station of Warri.

Mr. Parkinson's Journey in Somaliland.—Mr. J. B. Parkinson, who is at present in Somaliland, engaged on a survey of the country south-east from Berbera, writes from his camp near Diriderieh, in the Habr Toijaleh country (30° 42' N., 46° 3' E.), under date November 16, informing us of the progress made so far. He had begun his survey at Huguuf, on the caravan road to Karan, and was proceeding slowly eastwards, stopping two or three days at each camp for the purpose of rating his chronometer. The cloudless nights had been exceedingly favourable for theodolite observations. The camp from which he wrote was on a plain 25 miles wide, well covered with scrub and grass, and supporting large herds of camels and flocks of sheep, as well as wild game. Some fine mountain peaks lay in the direction of the future route (east-north-east), at a distance of three days' march. The traveller fears that his trip will be necessarily curtailed owing to the rise in wages and in the price of camels by reason of the demand for men and animals for the war in Abyssinia.

Mr. Moore's Zoological Researches in Lake Tanganyika.—The *British Central Africa Gazette* for November 15, 1895, announces that Mr. J. E. S. Moore, who went out last year under the auspices of the Royal Society to study the marine forms of life in Tanganyika, had recently passed through Zomba on his way to the coast. His journey appears to have been very successful, and he is said to have collected much information on the zoology and geology of the southern shores of the lake, apart from the more immediate object of his investigations. Besides various journeys on both shores of the lake, which extended northwards on the east side as far as Karuma, he had crossed the mountains separating Tanganyika from Lake Rukwa, of the north-west end of which he obtained a distant view. Mr. Moore proved the existence in Tanganyika of a large fish, which rushes at the paddles of passing canoes, and also discovered a large electric fish in the lake. Sponges were also found, which, though small, were undoubtedly real sponges.

Forest-planting in the Sahara.—In the *Revue Scientifique* for November 28, 1890, M. P. Privat-Deschanel discusses the question of the possibility of the reforestation of the Sahara, of which certain travellers, especially M. Largeau, have entertained such sanguine views. While dismissing as Utopian all ideas of effecting a change on a large scale, such as would alter the general atmospheric conditions and admit of cultivation everywhere, M. Deschanel points to the success of certain local experiments, at El Golea and elsewhere, which prove that in valleys favoured with a small amount of water (such as is found in almost all the Saharan depressions), such trees as the tamarisk, acacia, eucalyptus, and poplar can be grown with success. Contrary to what might have been expected, the poplar proves to be the tree most capable of resisting the influence of the desert. Under the shelter of the trees, all kinds of vegetables and fruit trees can be grown. M. Deschanel urges that such local attempts to improve the desert should be persevered in, but that the arid plateaus should be definitely abandoned as hopeless.

Spanish Exploration in Fernando Po.—In 1883, Spanish Roman Catholic missionaries were sent to the Island of Fernando Po, and soon afterwards settled in three principal centres: one in the north, at Bansa (1886), near the bay of Santa Isabel (Maldonado bay); the other two in the two bays, which at west and east form the narrowest part (some 12 miles) of the island, and where the climate is healthier—Batete at San Carlos (George) bay (1887), and Concepcion (Melville) bay (1888). In contradiction to the reports of all previous travellers and settlers, the missionaries speak very favourably of the intelligence and love for work of the native Bubi, whom they have successfully trained in the cultivation of cacao. For many years Father Joaquin Joannola has resided in Fernando Po. He was first the head of Concepcion mission, and is now the superior of all the Catholic missions. His explorations through many parts of the island not previously visited by white men are geographically important. In December, 1895, he started with Father Ramon Abanell from Concepcion, and arrived, through the dense equatorial forest, at the Bubi village of Bahelia, 1610 feet above the sea. Next day they reached the top of a mountain 4430 feet high, which turned out to be an old crater, in the centre of which, and some 650 feet lower down, they saw an oval lake (1 mile long, half a mile wide, and 1000 feet deep), which they called do Loreto. The temperature of the water was $63\frac{1}{2}^{\circ}$ Fahr. at 11 a.m. Some natives who accompanied the missionaries declared they had seen a hippopotamus in the water of Lake do Loreto. A careful survey of the surroundings failed to show any river coming out of it. This mountain seems to be at about the latitude of Concepcion bay, probably towards the Batei Sierra. Señor Emilio Bonelli, who publishes a short account of the travels of the two missionaries (with a view of Lake do Loreto), has recently visited Fernando Po more than once.* Father Joannola intended to study the unexplored regions of the island, principally those in the south-west, between the rivers Wovo and Ameswb and the Punta de Sagre (Cape Badgley), which on the map published by Baumann in 1887 is called "uninhabited primeval forest" (*unbewohnter Urwald*). Reports of some important explorations in Fernando Po are kept unpublished in the Spanish Archives, among them those of Colonel J. Gomez y Sanguan, Governor Barrana, and that of the very extensive exploration of Julian Pellon y Rodriguez, the manuscript of which (10 vols. in fol., with many maps, in the Navy Department at Madrid) was to a certain extent used by Herr Baumann.†

* "Un viaje al golfo de Guinea," *Boletín de la Sociedad Geográfica de Madrid*, xiv. p. 291, 1888. "Las misiones españolas de Fernando Po," *ibid.*, xxvi., 1890.

† Amado Osorio, "Condicionales de colonizacion que ofrecen los territorios españoles del golfo de Guinea," *Bolet. Soc. Geog. Madrid*, xii. p. 314, 1887; Luis Navarro y

AMERICA.

Ascent of Aconcagua.—We learn from a telegram, despatched to the *Daily Chronicle* from Mendoza on January 16 by two members of Mr. Fitz Gerald's expedition, and published in the issue of that paper on January 18, that the ascent of Aconcagua, the highest mountain in South America, has been accomplished. Starting from Inca on December 23, the expedition proceeded up Horcane's valley and passed round to the north of the mountain, camping at 14,000 feet on the 24th. They reached a col (19,000 feet) on the 25th, where the aneroids broke down. The weather was very bad. On the 26th two porters were ill, and had to be sent down. Zurbriggen this day found Güssfeldt's card at 21,000 feet. (The height of this point, as measured by Dr. Güssfeldt, was 21,523 feet). December 27 they were forced to descend. On the 30th they made another attempt. This time they found their boiling-point thermometers useless, not being graduated to read low enough for use at such altitudes. On the 31st Zurbriggen's feet were frost-bitten, and he had to be carried up. Friction restored his circulation. On January 2 they reached an estimated height of 22,600 feet, and had to return to the valley, where Zurbriggen was almost drowned in a river. After starting again on January 9, they camped on the 13th at an estimated height of over 20,000 feet. On the 14th they reached the final ridge between the two peaks, at an estimated height of 23,000 feet. Mr. Fitz Gerald was here forced to turn back by illness. Zurbriggen went on to the summit, apparently alone, and reached it at 5 p.m. Mr. Fitz Gerald intended to make a fourth attempt. The telegram states that the mountain is over 24,000 feet high. It is evident that Mr. Fitz Gerald has undertaken a task of very great difficulty, and that he is pursuing it with much pluck and determination. The question of the altitude of the peak is one of some importance. In the year 1853 Dr. P. Güssfeldt* made important explorations in this region, during which he ascended the Maipo, and reached a height of 21,523 feet on Aconcagua, but was compelled to turn back by bad weather. He was provided with the best instruments, and is known to be an accomplished observer. He spent some days carefully measuring a base and taking observations with a theodolite for the purpose of calculating the height of Aconcagua. The altitude deduced by him was 6970 metres (22,865 feet). It is not probable that this altitude can be very much in error. The *Daily Chronicle* telegram mentions only the failure of the instruments carried up the mountain with a view to determine the altitudes arrived at. It is probable, therefore, that the figures quoted are only estimates. Mr. Fitz Gerald is understood to be equipped with a good theodolite, and to be capable of using it: so that we may expect to receive hereafter from him a careful measurement of the height of the points he reaches.

POLAR REGIONS.

Lieut. Peary's Proposed Plan for reaching the North Pole.—At the annual meeting of the American Geographical Society of New York, held on January 15, Lieut. Peary, after returning thanks for the presentation of the Cullum gold medal, proceeded to unfold his plan for a new expedition, which is to aim at reaching the north pole, a plan which has already been endorsed by the New York society. Having given it as his opinion that the results of recent

Calizares, "Ligeres Consideraciones sobre el estado de las posesiones españolas del golfo de Guinea," *idem*, xiv. p. 157, 1888; "Las misiones españolas de Fernando Pó y sus dependencias," *idem*, xvi. p. 279, 1890; German Garibaldi, "La Isla de Fernando Pó," *idem*, xvii. p. 94, 1891; "La Guinea española," *idem*, p. 7.

* 'Reise in den Anden von Chile und Argentinien.' Berlin, 1857. See *Feld Alpine Journal*, xlii. pp. 558, et seq.

expeditions serve to show that the only feasible route by which to attain the north pole is that by Smith sound and the north-west coast of Greenland, the speaker pointed to the important work to be done in these regions in addition to the reaching of the pole. He proposes the raising of sufficient funds to enable the work of the expedition to be continued, if need be, for ten years. Having advanced to Sherard Osborn fjord, or farther, in a ship manned by a minimum crew—having taken on board en route several picked families of Eskimo—he would land the people and stores and send back the ship. During the autumn sledging-season he would advance supplies north-eastward along the coast by short and rapid stages, taking advantage also of the brilliant winter moons. The party itself would follow stage by stage, living like the Eskimo in snow-houses, so that in early spring it should have already reached, with the bulk of its supplies, the northern terminus of the North Greenland archipelago, whence, ice conditions being favourable, a dash for the pole would be made with the lightest possible equipment, with picked dogs and two of the best Eskimo. Each succeeding summer the ship would attempt to reach the base, whence the series of *caches* already formed at each prominent headland would supply a line of communication with the advanced station. Allowance would, however, be made for the failure of the ship to reach the base during one or more years. Should it be impossible to pass Robeson channel the first year, the expedition would employ the first season in the exploration of the neighbourhood of Hayes sound. Lieut. Peary insists on the necessity of making the party as small as possible, and dwells on the advantages arising from the employment of Eskimo, and from the existence of land for a base. Retreat would always be possible from Sherard Osborn fjord across the inland ice to Whale sound.

Gold Medal awarded to Lieut. Peary.—The first gold medal of the American Geographical Society of New York, the fund for which was given by the late General Cullum, has been awarded to Lieut. Peary, and was presented to the explorer by the President, Judge Daly, at the annual meeting of the society on January 12. Of Mr. Peary's many services to the geography of the arctic regions, that which is selected as the special ground for the award is his delineation, in 1892, of the coast-line of Greenland and the consequent demonstration of its insular character. A particular interest attaches to the circumstance that Lieut. Peary is the first recipient of the Cullum medal, from the fact that its donor was one of the most cordial well-wishers of the explorer on his first setting out for the arctic regions in 1891, but did not survive to congratulate him on his successful return the following year.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Earthquakes and Changes of Level.—In accordance with the wish expressed by the Third International Geographical Congress, the Military Geographical Institute of Vienna has repeated a number of levellings in districts affected by earthquakes. The great earthquake at Agram (Croatia) on November 9, 1880, was followed by minor seismic disturbances, which finally terminated in April, 1885; and in 1885 and 1886 a number of triangulations and determinations of level were repeated, under exactly similar conditions, for comparison with observations made in 1878 and 1879, before any disturbance took place. The differences found have now been worked up by Lieut.-Colonel Franz Lehl, and will shortly be published by the Institute. This is the first occasion on which the method of direct measurement has been applied to the effects of earthquakes, and the results show that an extremely interesting field of research has been opened up. Mr. A. Weiskler, assistant at the Institute, has been able to work out a comparison of four trigonometrically fixed points in the same region in 1816, 1855, and 1886. The points

were the towers of the Domkirche and Markuskirche in Agram, the tower of St. Martin's Church in the village of Dugoselo, about 12½ miles to the east, and a bench-mark on the Bisira, a peak of the Sijeman Gebirge, 3400 feet high, lying to the northward. The horizontal movements were found to range between 1·21 and 8·83 feet, and the vertical between 0·66 and 8·63 feet; the height of the Domkirche above sea-level was, in 1816, 445·16 feet, in 1885, 436·43 feet, and in 1886, 440·97 feet. These observations show at least that datum marks of this kind cannot be trusted for any extended period.

GENERAL

Geographical Association.—The Annual Report shows a steady growth in the members of the association, which is now represented in forty-five secondary schools, including most of the great public schools. In the course of the year two lectures have been published—one by Mr. B. B. Dickinson, explaining his method of teaching geography by means of lantern-slide maps and diagrams; the other by Mr. E. B. Wetley, entitled "A Geography Lesson: the Blackboard and Oral Teaching." A revised catalogue of the association's lantern slides, then amounting to 684, was issued in March. The number has since been considerably increased, and Mr. Dickinson is now engaged in remaking many of the early experimental slides, with improvements suggested by increased experience and newer methods. Demonstrations of the use of the optical lantern in teaching geography were given at the general conference of the Teachers' Guild in January, 1896, and at the Headmasters' Conference in December, as well as on other occasions. The chief work of the past year has, however, been to prepare and send out a memorial to certain boards of public examinations on the subject of reforms in examinations in geography. An account of this memorial was given in the *Journal* for June, 1896 (vol. vii. p. 664). The results thus far obtained are recorded in a separate report, and are in some instances most encouraging. The Oxford and Cambridge delegates for local examinations expressed their general agreement with the principles advocated by the association, and their willingness to consider any more detailed suggestions that the association might wish to make. With the view of encouraging the higher study of geography, and of providing an examination which may serve as a satisfactory test of a teacher's knowledge of the subject, they have decided to include geography as a new group in the higher local examinations. The Oxford and Cambridge Schools Examination Board, after considering the memorial, decided to insert the following paragraph in the regulations affecting geography in the Lower Certificate examination: "The questions shall be set on the assumption that the main principles of physical geography form the basis of geographical teaching." The Council of the Victoria University, Manchester, received the memorial with much favour, and a special committee of the Board of Studies has been appointed to consider the question of giving geography a more important place in the preliminary examinations. The improved style of the questions set in the Army entrance examinations during the last few years confirms the belief that the Civil Service Commissioners are to a large extent in sympathy with the aims of the association; but the marks assigned to the paper on geography (500) are certainly inadequate, in view of the amount and wide range of the knowledge that is required. The annual meeting was held in the hall of Dr. Williams's library, Gordon Square, on December 23, Mr. J. G. Colmer, c.m.g., in the chair. After the transaction of the usual business, a paper was read by Mr. A. W. Andrews on "the Teaching of Geography in Preparatory Schools and Junior Classes," followed by a discussion. Mr. Andrews also reported that at the Conference of Headmasters of Preparatory Schools held on the previous day, a resolution had been passed "that it is advisable that every boy, before admission

to a public school, should have to pass an elementary examination in geography." To this resolution the committee of the Geographical Association have decided to give their hearty support. Copies of the reports, of which the above is a summary, can be had on application to the honorary secretary, Mr. B. B. Dickinson, at Rugby.

A French Monument to Captain Cook at Méréville.—Prince Roland Bonaparte has kindly sent us photographs of the monuments in the park at Méréville erected to the memory of Captain Cook and MM. de la Borde, to which we alluded in the *Journal* for April last (vol. vii. p. 485). That to Captain Cook is here reproduced. It is placed in the most retired and agreeable part of the park, near the banks of the stream which flows through it, and surrounded by foreign species of



COOK'S MONUMENT AT MÉRÉVILLE.

trees. It consists of a sarcophagus of white marble, surmounted by an urn of the same material, the whole covered by a dome supported by pillars. The monument displays a bust of Cook, with a bas-relief representing a lion devouring an eagle, and there is the figure of a savage at each of the four corners. Verses have been inscribed at various parts. Méréville is in the department Seine-et-Oise, and the

park, which contains many other monuments of various kinds, was the creation of the financier De La Borde, the same who paid this tribute to Cook's memory.

The Arago Medal and M. d'Abbadie.—The Arago medal of the Paris Academy of Sciences, which is only awarded on rare and special occasions, was given last year in duplicate, one medal being presented to Lord Kelvin on the occasion of his professorial jubilee, the other to the veteran French explorer, M. Antoine d'Abbadie, whose career corresponded in time with that of the late M. Vivien de St. Martin. In presenting the medal, the President, M. A. Coëan, put forward M. d'Abbadie as the best possible model for the young explorers who are now developing the interests of France in Africa. On leaving college in 1829, he had formed the resolution of exploring North-Eastern Africa, and laboured for six years to qualify himself for the work, including in this preparation a visit to Brazil to carry out some special magnetic observations. He spent ten years in Africa, exploring Abyssinia and the surrounding districts from all points of view, and his map still stands as a base for actual work. In his last years, he has established at Abbadia, near Hendaye (Basses Pyrénées), an astronomical and physical observatory, which he has presented, completely endowed, to the Academy of Sciences.

Geographical Bibliography.—In the *Journal* for January last year (vol. vii., 1896, p. 72) we noticed the publication of the first volume of the *Bibliothèque Géographique*, by the Berlin Geographical Society, and pointed out the great value of the work. The first volume dealt with the geographical literature of the years 1891 and 1892; and volume II. for the year 1893 has now been published. Much praise is due to Dr. Baschin for his prompt preparation of this great record of over 10,000 titles, and we may hope soon to see the work brought up to date. The suggestions put forward in our notice have been adopted in the new volume, and add to the convenience of reference. Mathematical and physical geography have been separated as principal headings; the sub-head of physical geography under each country has been further subdivided, thereby making the references more readily accessible, and several minor improvements have been made. In the references to geographical journals, a system similar to that adopted in our "Literature of the Month" is made use of, but on a much extended scale. Perhaps the most remarkable feature of this bibliography is its extraordinary richness in Slavonic literature; this is a matter of great importance, as much that is written in Russian and the allied languages is of geographical value, and, from the general ignorance of the Slavonic group of languages, is usually ignored in Western Europe. Seeing that geographical journals find their most diligent readers, as a rule, in foreign countries, it might not be too much to hope that in time the editors of journals should add at least a translation of the title, if not an abstract, in French, German, Italian, or English, when the memoir is not written in one of these languages.

The Twelfth German "Geographentag" is to be held this year at Jena, from the 21st to the 23rd of April, under the presidency of Dr. G. Neunmayer and Dr. W. Kukenbal. The subjects for consideration are divided into the following six groups: (1) Report of the south polar committee appointed two years ago at Bremen; (2) polar exploration, north and south; (3) geophysics, including questions connected with earthquakes, earth-magnetism, etc.; (4) biological geography; (5) geography of Thuringia; (6) educational questions. A visit to Weimar is included in the programme, and combined geological and geographical excursions in the neighbourhood of Jena are also contemplated. Opportunity will be given to the members to visit Zeiss's optical instrument works, as well as the glass works of Schott & Co.

Geographical Terms.—In the *National Geographic Magazine* for September,

1896 (vol. vii. p. 291), Mr. R. T. Hill of the U.S. Geological Survey shows the remarkable richness of the Spanish language in describing the land-forms of Texas and New Mexico. He has collected from the maps no less than 23 names for different kinds of elevations, 5 of different kinds of plains, 4 of varieties of declivities, and 17 for rivers and their valleys; and of all these he vouches for the appropriateness and precision. We think, however, that he unduly depreciates the value of the English language in this respect, for we believe that if the sheets of the Ordnance Survey were searched through, and all local names for land-forms tabulated, the list would not be far inferior in point of numbers to that obtained from the Spanish-American region. But these local names are not as they stand true geographical terms; they require to be extended and defined, and above all to be accepted by geographical writers, before they can be of practical service. Seeing words of a familiar and often undignified form on our maps often prevents us from appreciating their value as means of discriminating between land-forms, while literal translations of the same words in a foreign language may strike one as distinctive and suitable for adoption. It would certainly be advisable to carefully collect and critically examine existing English words, and especially dialect words, before deciding that it is necessary to adopt terms wholesale from other languages.

OBITUARY.

M. Vivien de St. Martin.*

IN M. Vivien de St. Martin, France has lost a veteran and distinguished geographer, whose connection with the science dated back, at the time of his death, through no less a period than three-quarters of a century.

Born in 1802, M. de St. Martin had attained the great age of ninety-four years. His taste for geographical studies was early developed, and he displayed a natural instinct for the construction of maps to illustrate his reading, especially when it dealt with ancient times. It was, throughout his life, the historical and human side of geography which exercised the most powerful attraction on him. Geography did not mean, in his eyes, merely the description of the surface of the Earth, but always combined the study of the soil with that of the peoples who dwelt on it, and, like Ritter in Germany, he traced the reciprocal action of each of these factors on the other. All his writings show the influence of this bent of mind.

In 1821 M. de St. Martin took part in the foundation of the Paris Geographical Society, the oldest society of the kind devoted to the furtherance of the progress of geography as a science. His colleagues in this useful work, though few in number, were remarkable for the leading position which they held in the scientific world, including as they did such names as Malte-Brun, Ouvier, Jomard, Walckenaer, Eyriès, and others hardly less distinguished. After some years spent in other than geographical work, but during which he never relaxed his endeavours to acquire, by the study of his favourite science, such a foundation of knowledge as should qualify him for future original work, M. de St. Martin finally adopted an exclusively geographical career in 1840, when he accepted the post of general secretary to the

* The following account of M. de St. Martin is derived chiefly from some manuscript notes written by himself in 1878, on the occasion of the award to him of the Paris Geographical Society's medal, which have been kindly placed at our disposal by M. Monodier.

society he had helped to found. Soon afterwards he became editor of the *Annales de Voyages*, which had since 1806 been conducted successively by Malte-Brun, Klaproth, Eyriès, and Ternaux-Compans, retaining the sole management for fourteen years. During this time the first two volumes of an exhaustive history of geography, which, however, was never carried further on the same scale, appeared, as well as two volumes on the history of human races, a study which always had a special fascination for their author. This natural bent of his mind led him in 1846 to take part in the foundation of the Société d'Ethnologie in Paris.

In 1850, and again in 1858, M. de St. Martin carried off the prize offered by the French Academy for studies on the ancient geography of North-West India and North Africa respectively, these being the only two occasions during thirty years on which prizes were given for geographical subjects. Other papers on kindred subjects were read by him before the Academy, and published in the *Mémoires des Savants Étrangers*. In all these he was careful to adopt a rigorous and positive method of investigation, never allowing himself to stray into the region of hypothesis. He collected and classified the accounts of ancient authorities, discussed them, and formed his conclusions by comparing them with the actual facts as revealed in modern times.

From 1863 to 1876 much of his time was taken up with the editing of the *Année Géographique*, which he founded in the first-named year. In 1873 he published his 'Histoire de la Géographie,' a work which still remains the clearest general account, within moderate compass, of the progress of geographical knowledge from the earliest times. He brings out in it the parallel advance of the civilization of the so-called Caucasian race, and of the knowledge of the Earth, showing how that race alone has looked beyond the bounds of its own dwelling-place, and known no limits for its investigations but those of the world itself.

For some years before this, M. de Martin had been engaged in the preparation of the great 'Dictionnaire de Géographie Moderne,' which has only recently been completed, and of which the first parts were issued in 1877, when its author had already reached the age of seventy-five years. The merits of this vast work as an indispensable book of reference for geographers are too well known to need dwelling on here. On the completion of the first volume in 1879, M. de St. Martin resigned the direction of the work into the hands of M. L. Rousselet, and devoted the remaining years of his life to his favourite studies in historical geography. He at one time contemplated the issue of a 'Dictionary of Historical Geography,' as a complement of the modern dictionary, but the idea seems never to have been carried out. He, however, continued until 1890 to superintend the publication of Hachette's 'Atlas Universel de Géographie Moderne,' begun in 1878. In 1891, however, he resigned the work to M. Schrader, who had previously been his coadjutor.

M. de St. Martin was for some years a vice-president of the Paris Geographical Society, and since 1872 had been on the list of honorary presidents. He had been for the last three years an honorary corresponding member of our own Society.

Major P. W. G. Copland-Crawford.

There can now, unfortunately, be no room for doubt that Major Copland-Crawford, who since 1892 had been a Fellow of our Society, is included in the list of victims of the lamentable Benin disaster. The deceased officer, who belonged to the 7th Battalion of the King's Royal Rifle Corps, was in 1894 appointed Deputy Commissioner and Vice-Consul in the Niger Coast Protectorate, which post he held at the time of his death. In January, 1896, he made a journey from Warri to the

Benin river, with a view to discovering a feasible overland communication between Warri and Sapele (*Journal*, vol. vii. p. 681). He possessed an intimate knowledge of the country generally, which, it was hoped, would have proved of much value in the course of the expedition.

Antonio Cecchi.

The well-known Italian explorer, Antonio Cecchi, has, together with various officers and men of the Italian gunboats *Volturno* and *Stafetta*, lately fallen a victim to the treachery of the Somalis of the Benadir coast, of which he was administrator. During a trip towards the Wabi Shobei, the party was suddenly attacked by night, and, after expending most of its ammunition, was obliged to beat a retreat, amidst renewed attacks by the Somalis. All the officers lost their lives, and only three men succeeded in reaching Mogilishu. Cecchi was best known for his journey to Abyssinia and the Galla countries between the years 1877 and 1882. The expedition, as at first constituted, was nominally under the command of the Marquis Antinori, Cecchi being entrusted with the astronomical and meteorological observations; but of the five Europeans who took part in it, only Cecchi and Dr. Chiarini proceeded beyond Shoa, the latter subsequently dying of fever, while the former spent several years as a prisoner in the southern Galla countries before returning to the coast. The results of this journey were published in two octavo volumes at Rome in 1880, followed in 1887 by a third dealing with the topographical surveys. Cecchi was afterwards for some years Italian consul at Aden, and since 1890 had held a similar post at Zanzibar, where he was universally respected and beloved.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1896-97.

Afternoon Technical Meeting, Thursday, December 10, 1896.—SIR CLEMENTS MARKHAM, K.C.B., President, in the Chair.

The Paper read was:—

"The Weston Tapestry Maps." By the Rev. W. K. R. Belford, M.A.

Fourth Ordinary Meeting, January 4, 1896.—Admiral W. J. L. WHARTON, C.B., F.R.S., Vice-President, in the Chair.

ELECTIONS.—*Professor John Norman Collie; Vaughan Cornish; Henry Cox; Rev. John Gabriel Cronwell; Thomas Ralph Douae; Hon. T. F. Frenantle; Lieut. William Goodenough, R.N.; Major E. C. Hawkshaw, late R.A.; Harry Thomas Hipkine; Adolph Frederick Howard; John Samuel Hudson; Robert Irvine; William Edward Kingsford; James MacIntosh; Douglas Walter Money; Arthur Reginald Muro; Arthur H. Neumann; Francis William Preston; William Douglas Sneddon; Thomas Alford Smith; John Rowland Taylor; Thomas Edward Turgross; L. Wiener.*

The Paper read was:—

"An Expedition to the Marotse Country." By Captain A. S. Gibbons, with additions by Percy C. Reld, and Captain Alfred Bertrand.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., Librarian, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Académie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.

Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Seelskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 x 6½.

EUROPE.

Austria.

Hydrographischer Dienst in Österreich. Ergebnisse der Beobachtungen über die Gewitterregen vom 1. August 1896 in Nieder-Österreich. Herausgegeben von K. K. hydrographischen Central-Bureau. Sonderabdruck aus der "Österreichischen Monatschrift für den öffentlichen Baudienst," Heft IX., 1896. Wien, 1896. Size 14½ x 10½, pp. 16. Maps.

A detailed account, with maps, of the rainfall over Austria during a severe thunderstorm.

France. *R. Union G. Nord de la France* 17 (1896): 12-23. Ardouin-Dumazet.
Les lles Bretonnes, conférence de M. Ardouin-Dumazet.

France. *C. Rd.* 123 (1896): 845-847. Delebecque.
Sur l'étang de Berre et les étangs de la côte de Provence situés dans son voisinage. Note de M. André Delebecque. Also a separate copy. Presented by the Author.

France. *B.S. Languedoc G.* 18 (1895): 391-432; 19 (1896): 25-35, 207-243. Blazin.
Le Minervois et la commune d'Olonzac. Par M. Blazin.

France—Amélie-les-Bains. Merria.
B.S. Languedoc G. 17 (1894): 310-331; 18 (1895): 5-26, 139-170, 315-331, 434-452.
Amélie-les-Bains. Le climat et les eaux sulfureuses. Par le Dr. C. Van Merria.
With Illustrations.

France—Early Maps. *R.S.G. Ann. Bordeaux* 19 (1896): 545-559. Hautreux.
Les cartes de Masco (1707-1724). Par A. Hautreux.

Masco was an engineer who made large-scale maps of part of France, and a number of sheets including the country between the Garonne and Arousson have recently been presented to the Geographical Society of Bordeaux.

France—Hérault.

Geographie générale du Département de l'Hérault publiée par la Société Languedocienne de Géographie, avec cartes spéciales et générales, plans de villes, vues de sites, monuments, etc. Tome Premier. Introduction, Orographie, Géologie, Hydrologie, et Minéralogie: 11^{me} Fascicule. Météorologie, avec neuf planches hors texte. Montpellier, 1891-93. Size 10 x 6½, pp. lxxiv and 468. Presented by the Languedoc Geographical Society.

This is the first of four intended volumes of a very comprehensive geography of the department of Hérault, due to the enterprise of the Languedoc Geographical Society at Montpellier. It deals with the orography, geology, hydrology, mineralogy, and meteorology of the department, thus fully describing the physical geography. 11

is illustrated with numerous maps, diagrams, and photographs, and the letterpress is contributed by various professors of the University of Montpellier.

Germany. *M. Ver. Erdk. Halle* (1896): 60-64. **Kirchhoff.**

Etwas vom Kiffhäuser. Von Prof. Dr. A. Kirchhoff (Halle). *With Map.*

On the hill-group of Kiffhäuser, south of the Harz.

Germany. *Aus allen Welttheilen* 22 (1896): 3-14. **Kirchhoff.**

Deutschlands natürliche Gliederung und seine geschichtliche Grenzverengung. Von Professor Dr. Alfred Kirchhoff.

Germany. *Deutsche Rundschau G.* 16 (1896): 80-84.

Städtebevölkerung Deutschlands, 1895.

Germany—Geodesy.

Jahresbericht des Direktors des Königlich Geodätischen Instituts für die Zeit von April 1895 bis April 1896. Potsdam, 1896. Size 9½ × 6½, pp. 28.

Germany—Harz. *M. Ver. Erdk. Halle* (1896): 27-35. **Steinhoff.**

Die Sage von der Harzer Rossrappe. Von Oberlehrer R. Steinhoff.

On the legends of the Harz.

Germany—Havel. *Petermanns M.* 42 (1896): 234-236. **Schlottmann.**

Die Havel bei Plau 1846-90. Von K. Schlottmann.

On the hydrographical conditions of the river Havel at Plau.

Germany—Mansfeld. *M. Ver. Erdk. Halle* (1896): 55-60. **Grössler.**

Zur Historischen Karte der beiden Mansfelder Kreise. Entworfen von Prof. Dr. H. Grössler (Eisleben). *With Map.*

Germany—Prussia. *M. Ver. Erdk. Halle* (1896): 1-27. **Halbpass.**

Der Arondsee in der Altmark. Von Dr. W. Halbpass. Erster Teil. *With Map and Profiles.*

Germany—The Oder.

Der Oderstrom, sein Stromgebiet und seine wichtigsten Nebenflüsse. Eine hydrographische, wasserwirtschaftliche und wasserrechtliche Darstellung. Auf Grund des Allerhöchsten Erlasses vom 28. Februar 1892 herausgegeben vom Bureau des Ausschusses zur Untersuchung der Wasserverhältnisse in den der Ueberschwemmungsgefahr besonders ausgesetzten Flussgebieten. Band I. Das Stromgebiet und die Gewässer (Allgemeine Darstellung). 1. Abtheilung: Hydrographie und Wasserwirtschaft (pp. xviii and 244. *Map*). 2. Abtheilung: Recht und Verwaltung des Wasserwesens (pp. 116). Band II. Gebietsbeschreibungen der einzelnen Flussgebiete (pp. 336). Band III. Strom- und Flussbeschreibungen der Oder und ihrer wichtigsten Nebenflüsse. 1. Abtheilung: Die Oder von der Quelle bis zum Stettiner Hafl. 2. Abtheilung: Die wichtigsten Nebenflüsse der Oder. 3. Abtheilung: Die Warthe und ihre wichtigsten Nebenflüsse (pp. 382, size 11½ × 8). Tabellen und Anlagen (pp. 244, size 14 × 10½). 36 Kartenbeilagen. Size 21½ × 18. Berlin: D. Reimer, 1896. *Presented by the Publisher.*

Detailed reference will be made to this great work.

Greece. *Z. Ges. Erdk. Berlin* 31 (1896): 193-204. **Philippson.**

Reisen und Forschungen in Nord-Griechenland. Von Dr. Alfred Philippson. III. Teil. *With Map and Profiles.*

Hungary. **Jekelfalussy.**

L'État Hongrois millénaire et son peuple. Rédigé sur ordre de M. le Ministre Royal Hongrois du Commerce, Président de la Commission de l'Exposition Nationale Millénaire. Par le Dr. Joseph de Jekelfalussy. Budapest: 1896. Size 9 × 6, pp. 608. *Presented by the Author.*

This presents a full account of the Hungarian monarchy, touching on its geography, history, and its present state as regards economic prosperity and intellectual activity.

Hungary—Budapest. *Abregé B.S. Hongroise G.* 24 (1896): 9-15. **Berecz.**

Population de la ville de Budapest. Par Antoine Berecz.

Hungary—Germans. *Petermanns M.* 42 (1896): 280-282. **Langhans.**

Die Verbreitung der Deutschen in den Ländern der Ungarischen Krone, 1890. Begleittworte zu Taf. 26 von P. Langhans. *With Map.*

Hungary—Lakes. *Abregé B.S. Hongroise G.* 24 (1896): 1-9. **Hannuz.**

Die stehenden Wasser unserer Länder. Von Stefan Hannuz.

- Hungary—Rumaniana.** *U.S.G. Board* 17 (1896): 114-167. **Vancu.**
Despre România din Ungaria de Petru Vancu.
- Iceland.** *Petermanns M.* 42 (1896): 266-275. **Kellhack.**
Aus dem nordöstlichen Island. Aus dem Reisebericht über den Sommer 1895.
Von Dr. Th. Thoroddsen. Von Dr. K. Kellhack. *With Map.*
- Iceland.** *G. Tidsskrift* 13 (1896): 140-156. **Thoroddsen.**
Nogle almindelige Bemærkninger om Islandske Vulkaner og Lavastrømme. Af
Dr. Phil. Th. Thoroddsen.
- Iceland—Earthquakes.** *G. Tidsskrift* 13 (1896): 168-172. **Thoroddsen.**
Foreløbige Meddelelser om Jordbævsene i Island i August og September 1896.
Ved Dr. Phil. Th. Thoroddsen. *With Map.*
- Iceland—Earthquakes.** *Globus* 70 (1896): 309-311. **Gebhardt.**
Das Erdbeben auf Island am 26/27 August und 5/6 September 1896. Von Dr.
Phil. August Gebhardt. *With Sketch-map.*
- Iceland—Skaptár Jökull.** *Aptas J.* 18 (1896): 216-221. **Anderson.**
The Skaptár Jökull. By Tempest Anderson. *With Illustrations.*
- Italy—Central.** **Baedeker.**
Italy. Handbook for Travellers. By E. Baedeker. Second Part: Central Italy
and Rome. Twelfth Revised Edition. Leipzig: K. Baedeker; London: Dulau
& Co., 1897 [1896]. Size 6½ x 4½, pp. lxxiv, 438, and 14. *Maps; Plans; Pan-
orami, etc.* Price 7 marks 50 pf. Presented by Messrs. Dulau & Co.
- Italy—Piedmont.** *Globus* 70 (1896): 381-387. **Halbfaas.**
Saley und Ager, zwei kleine deutsche Sprachinseln in Piemont. Von Dr.
Halbfaas.
- Italy—Sardinia.** *Deutsche Reisechau* G. 19 (1896): 1-3, 60-65. **Hellwald.**
Streifzüge auf der Insel Sardinien. Von Friedrich v. Hellwald. *With Illus-
trations.*
- Norway—Glaciers.** *G.Z.* 2 (1896): 303-319. **Richter.**
Die Gletscher Norwegens. Von E. Richter in Graz. *With Illustrations.*
Also separate copy. Presented by the Author.
- Portugal—Torres Vedras.** *J.R. United Service J.* 40 (1896): 1335-1357. **Shore.**
A Visit to the Lines of Torres Vedras. By Commander the Hon. H. N. Shore,
R.N. *With Maps and Illustrations.*
- Pyrenees.** *C.Rd.* 122 (1896): 712-713. **Stuart-Menteth.**
Sur le mode de formation des Pyrénées. Note de M. P.-W. Stuart-Menteth.
- Rumania.** **Banger.**
Rumänien, ein Land der Zukunft. Von G. Banger. Stuttgart: J. Engelhorn,
1896. Size 11½ x 8, pp. viii and 152. *Maps, Portraits, and Illustrations.* Price 5s.
A general description of Rumania, with the latest statistics and an account of the
people, towns, and industries, illustrated by the reproduction of numerous photographs.
- Russia.** **Krichtsfovitch.**
Annuaire géologique et minéralogique de la Russie; rédigé par N. Krichts-
fovitch. Vol. 1, livr. 1 (deuxième moitié). Varsvie, 1896. Size 12½ x 9.
- Russia—Caucasia.** *C. Rd.* 123 (1896): 900-911. **Vénokoff.**
Recherches géologiques dans le Caucase central. Note de M. Vénokoff.
- Russia—Germania.** *Globus* 70 (1896): 232-237. **Hoops.**
Die Reste der Germanen am Schwarzen Meere. Von Prof. Johannes Hoops.
Heidelberg.
A summary of Loewe's book bearing the same title.
- Russia—Transcaucasia.**
Beobachtungen der Temperatur des Erdbodens im Tifliser Physikalischen Observa-
torium im Jahre 1896. Tiflis, 1896. Size 9½ x 6½, pp. iv, vi., and 224.
- Russia—Transcaucasia.**
Beobachtungen des Tifliser Physikalischen Observatoriums im Jahre 1894.
Tiflis, 1896. Size 13 x 10, pp. xxxii. and 198.

Scandinavia.**De Geer.**

Om Skandinavien's geografiska Utveckling efter Isiden. Af Gerard De Geer.
1. Text. 2. Kartor. Stockholm: P. A. Norstedt & Söner, 1896. Size $9\frac{1}{2} \times 6\frac{1}{2}$,
pp. 160. *Illustrations.* Price 4 kr. Presented by the Author.

A discussion of the gradual development of the geographical features of Scandinavia on the passing away of the great ice-sheet, and of the influence exercised by the diminishing ice-sheet on the origin of the present land-forms.

Spain—Algiciras. *J.R. United Service L.* 40 (1896): 1336-1367.

Notes on the Defence of the Bay of Algiciras. Translated from the "Memorial de Artilleria." With Map.

Spain—Ciudad-Real. *H.S.G. Madrid* 33 (1896): 7-18, 88-118.

Aguilera.

Historia de la provincia de Ciudad-Real desde los tiempos más remotos hasta la invasión de los árabes. Por D. Antonio Blázquez y Delgado Aguilera.

Spain and Portugal—Bibliography.

Foulché-Delbosc.

R. Foulché-Delbosc. Bibliographie des voyages en Espagne et en Portugal.—From *Revue hispanique* . . . publié par R. Foulché-Delbosc. Troisième Année. Nos 7, 8 et 9.—Mars—Juillet—Novembre, 1896. Pp. 1-349. Paris: A. Picard et Fils, 1896. Size $10 \times 6\frac{1}{2}$.

A special note will be given on this bibliography.

Spitzbergen.

Globus 70 (1896): 245-259.**Joest.**

Die letzte Überwinterung auf Spitzbergen. Von Prof. W. Joest. With *Illustrations*.

Contains a photograph of the much-talked-about "hotel" at Advent bay, and an account of the trip of the tourist steamer *Erling Jarl*, which reached $81^{\circ} 28' N$. last summer. It also refers to the shipwrecked party who spent the winter of 1895-96 at Advent bay.

Spitzbergen. *XV. Jahrb. Ver. Erdk. Dresden* (1896): 4-18.

Alvensleben.

Spitzbergen. Von Oskar von Alvensleben.

On a tourist trip to Spitzbergen in 1893.

Sweden.

B. Geol. I. University of Upsala 2, 1895 (1896): 345-361.**Helsing.**

Notes on the Structure and Development of the Torneor Störnar in Gesträskland. By Gustaf Helsing.

Sweden—Lake Mälär.

Witt and Lundell.

Bihang K. Svensk. Vetensk.-Ak. Handl. 21 (1895): 1-18.

Några hydrografiska iakttagelser i Mälaren och Saltsjön under Februari och Mars 1895. Af Hugo Witt och Gustaf Lundell. With *Plates*.

On the circulation of water in Lake Mälär and the channel which connects it with the Gulf of Bothnia.

Sweden—Nerike.

Sernander and Kjellmark.

B. Geol. I. University of Upsala 2, 1895 (1896): 317-344.

Eine Torneoruntersuchung aus dem nördlichen Nerike. Von Rutger Sernander und Knut Kjellmark. With *Plates*.

Sweden—Öland.

Bihang K. Svensk. Vetensk.-Ak. Handl. 21 (1895): 1-25.**Andersson.**

Om Öländska resurser. Af Joh. Gunnar Andersson. With *Plate*.

On the coast-forms of the island of Öland, with special reference to the erosion of the low cliffs.

Switzerland—Zürich. *XV. Jahrb. G. Ges. Bern* (1896): 3-124.

Waller.

Veränderungen der Erdoberfläche im Umkreis des Kantons Zürich seit der Mitte des 17. Jahrhunderts. Untersuchungen auf Grund der topographischen Karte von J. C. Gyger aus dem Jahr 1667, angestellt von Dr. Hermann Waller in Bern. With Map.

Switzerland—Zürich. *Petroleum M.* 42 (1896): 232-234.

Brückner.

Veränderungen der Erdoberfläche im Umkreis des Kantons Zürich seit der Mitte des 17. Jahrhunderts. Von Prof. Dr. Edward Brückner.

This was noticed in the *Journal* for December, vol. VIII. (1896), p. 634.

Turkey—Macedonia. *Geogr. Monats. Orient* 22 (1896): 101-114.

Makedonien.

Gives recent statistics of the population of the vilayets of Macedonia.

United Kingdom.

Statistical Abstract for the United Kingdom in each of the last fifteen years from 1881 to 1895. London: Kyre & Spottiswoode, 1896. Size 10 x 4½. pp. 204.

This statistical abstract includes revenue, expenditure, taxation, imports, and exports classified in various ways, shipping classified according to nationality and ports of entry, produce, traffic, coinage, banks, post-office, vital statistics, army, education, etc.

United Kingdom—Bird Migration. *Scottish G. Mag.* 12 (1896): 416-625. **Clarke.**
Bird Migration in the British Isles: its Geographical and Meteorological Aspects.
By W. Eagle Clarke.

United Kingdom—England—Canals.

The Federated Institution of Mining Engineers. Report of the Proceedings of the Conference on Inland Navigation, Birmingham, February 12th, 1895. With Map of English Canals. Edited by M. Walton Brown. Newcastle-upon-Tyne: Published by the Institution, 1895. Size 9½ x 6, pp. iv, and 132. Map.

Contains a general discussion on canals, special papers on canals serving the Severn district and Birmingham, and a map of English canals.

United Kingdom—England—Sussex.

Dygotte Sussex. By William E. A. Axon. London: W. Andrews & Co., 1897 [1896]. Size 9 x 6, pp. 258. Illustrations. **Axon.**

Includes a reprint of Drayton's Song of Sussex from the Polyolbion, with Selden's notes.

United Kingdom—English Topography.**Gomme and Milne.**

The Gentleman's Magazine Library; being a Classified Collection of the Chief Contents of the *Gentleman's Magazine* from 1731 to 1898. Edited by George Laurence Gomme. English Topography: part iv. (Durham—Gloucestershire), 1893, pp. xli. and 342; part vi. (Kent—Lancashire), edited by J. A. Milne, 1895, pp. xli. and 328; part vii. (Leicestershire—Monmouthshire), edited by J. A. Milne, 1896, pp. xiv. and 346; part viii. (Norfolk—Northamptonshire—Northumberland), edited by J. A. Milne, 1896, pp. xli. and 336. London: Elliot Stock. Size 9½ x 6. Price, each vol., 7s. 6d.

United Kingdom—Geographical education.**Arsnal.**

Redegjørelse eu med hjælp af officielle midler foretaget reise høsten 1894 i Skotland og England for at vinde nærmere kjendelse til undervisningen i geografi. Af Aksel Arsal. Kristiania: A. W. Brøgerss bogtrykkeri, 1896. Size 8 x 5, pp. [42]. Presented by the Author.

United Kingdom—Ireland.**Cullum.**

Quarterly J. R. Meteorological S. 23 (1896): 267-290.
Climatology of Valencia Island, County Kerry. By J. E. Cullum. With Map and Illustrations.

The importance of Valencia Island lies in the fact that it is the most westerly point from which meteorological observations bearing on changes coming in from the Atlantic are transmitted to the Meteorological Office.

United Kingdom—Scotland—Glasgow.**Bell and Paton.**

Glasgow, its Municipal Organization and Administration. By Sir James Bell, Bart., and James Paton. Glasgow: J. MacLehose & Sons, 1896. Size 10½ x 8, pp. xxiv. and 426. Frontispiece and Plans. Presented by the Authors.

An account of the civic growth and present municipal activity of Glasgow, which may serve as a model of a modern city where all the resources of local government and applied science are utilized. The chapters on the water-supply and on the Clyde navigation are of some geographical interest, although the latter might well have been longer. An introductory chapter on the causes of the growth of Glasgow is also very brief, and, while recognizing the importance of general geographical position, does not take account of the physical geography of the region. There is no mention of climate, no analysis of the composition of the population at various dates; there is one illustration, a view of the municipal buildings, and one map, a rough sketch showing the growth of the municipal area.

United Kingdom—Scotland—Place-Names.**Carnegie.**

Scottish G. Mag. 12 (1896): 609-616.
Place-Names of Ballynabiddy. Communicated by Mrs. Carnegie of Strougar.

A valuable collection of Gaelic place-names, many of them not marked on any map, but obtained from old people with whom all knowledge of them seemed likely to pass away.

United Kingdom—Wales. *Trans. Canadian I. S.* (1896): 64-73.

MacNish.

Wales and its Literature. By Neil MacNish.

United Kingdom—Wales and Monmouthshire.

Royal Commission on Land in Wales and Monmouthshire. Bibliographical, Statistical, and other miscellaneous Memoranda, being Appendices to the Report of the Royal Commission on Land in Wales and Monmouthshire. London: Eyre & Spottiswoode, 1896. Size 12½ x 8½, pp. 308. *Plans*. Price 5s. 3d.

This report includes an extensive bibliography of works relating to Wales and Monmouth.

Western Europe—Historical.

Sarmiento.

R. Festus Avenius. Ora Maritima. Estudo d'este poema na parte respectiva ás costas occidentaes da Europa. Por F. Martins Sarmiento. 2ª Edição. Porto, 1896. Size 10 x 6½, pp. xvi. and 164. *Map*. Presented by Sir John Evans.

Geographical and ethnographical discussion of the early knowledge concerning the coast of Western Europe.

ASIA.

Asia Minor—Euphrates Valley.

Yorke.

A Journey in the Valley of the Upper Euphrates. By Vincent W. Yorke. From the *Geographical Journal* for October and November, 1896. Size 10 x 6½, pp. 40. *Map and Illustrations*.

Asiatic Turkey—Babylonia. *Contemporary Rev.* 71 (1897): 81-96.

Sayce.

Recent Discoveries in Babylonia. By A. H. Sayce.

Central Asia and China.

Futterer.

Die allgemeinen geologischen Ergebnisse der neueren Forschungen in Zentral-Asien und China. Von Dr. Karl Futterer. Petermanns Mittheilungen, Ergänzungsheft Nr. 119. Gotha: Justus Perthes, 1896. Size 11 x 7½, pp. 69. *Map and Profiles*.

This will be specially noticed.

Eastern Tibet.

Rev. Française 21 (1896): 704-711.

Boula.

L'Exploration Boula au Tibet oriental. With *Map*.

India.

Globe 70 (1896): 373-378.

Zimmermann.

Die Entwicklung von British-Indien. Von Dr. F. W. R. Zimmermann. With *Maps*.

India—Hindu Kshatriya.

Uffalvy.

Les Aryens au nord et au sud de l'Hindou-Kouch. Par Charles de Uffalvy. Paris: G. Masson, 1896. Size 10 x 6½, pp. xvi. and 498. *Map*. Presented by the Author.

A treatise on the Aryan races dwelling on both sides of the Hindu Kush, taking advantage of the most recent data, such as Sir George Robertson's description of the Kafirs, and discussing the whole subject in its general bearings. An ethnographical map is given (in black and white), and there is an index.

India—Northern Shan States.

Macquoid.

Report of the Intelligence Officer on Tour with the Superintendent, Northern Shan States, 1893-96. Rangoon, 1896. Size 13½ x 8½, pp. 2, 48, 4, 4, 4, 2, 2, and 2. *Map and Illustrations*. Presented by the Quarter-Master-General in India.

Lieutenant Macquoid gives a diary of his journey through the Wa country of the northern Shan tribes, on the east side of the Salween, with notes on the villages and places of interest passed through. There are large-scale maps to illustrate the journey.

India—South Kanara. *J. Bombay Br. R. Asiatic S.* 19 (1896): 249-262.

Cunha.

The Portuguese in South Kanara. By J. Gerson da Cunha.

Indian Ports.

Marice and Roberts.

Tide-tables for the Indian Ports for the year 1897 (also January, 1898). Part I. Western Ports (Aden to Pamban Pass); Part II. Eastern and Burma Ports (Negapatnam to Port Blair). By Lieut. C. C. D. Marice and R. Roberts. By Authority of the Secretary of State for India in Council. Size 6½ x 4½, pp. 1140.

- Indo-China—Laos.** *B.S.G. de l'Est* (1896): 1-28. **Macey.**
Cinq ans au Laos, l'extension territoriale et économique de l'Indo-China. Par M. Paul Macey. *With Map.*
- Japan.** *Contemporary Rev.* 71 (1897): 153-62. **Tennant.**
The Commercial Expansion of Japan. By H. Tennant.
- Japan.** **Weston.**
Mountaineering and Exploration in the Japanese Alps. By the Rev. Walter Weston. London: J. Murray, 1896. Size $9\frac{1}{2} \times 7$, pp. xvi. and 340. *Maps and Illustrations.* Price 21s. *Presented by the Publisher.*
The interesting paper on the Japanese Alps contributed by Mr. Weston to the Royal Geographical Society will prepare readers for this beautiful volume, which gives an account of his mountaineering exploits at greater length, and much out-of-the-way information as to Japan and its people. The author's chapter on spirits and exorcism is reinforced by an appendix on exorcism in Korea by Dr. Landis, which is of peculiar interest. The book is illustrated from photographs and native drawings, and is completely equipped as to maps and index.
- Korea.** *Rev. Scientifique* (4) 6 (1896): 552-553. **Chastang.**
Les Coréens. Par M. L. Chastang.
- Malay Archipelago.** **Heeres.**
Bijl. Taal-, Land- en Volkenk. Ned.-Indië (6) 2 (1896): 698-719.
Documenten betreffende de ontdekkingsreizen van Adriann Dortman bevoeten en bezuiden Banda, op last van Antonio van Diemen en Cornelis van der Lijn ondernomen in 1645 en 1646. Medegedeeld door Mr. J. E. Heeres.
- Malay Archipelago, etc.** *XXV. Jahresb. V. Erdk. Dresden* (1896): 163-216. **Radde.**
Aus den asiatischen Tropen. Von G. Radde.
Account of a journey from Celebes to Singapore, with visits to Johor and Ceylon.
- Malay Archipelago—Celebes.** **Hookstra.**
Tijds. K. Ned. Aardrijksk. Genoot. (2) 13 (1896): 439-445.
Het Possumoor. Door Dr. J. F. Hookstra. *With Map.*
- Malay Archipelago—Java.** **Kronsecker.**
Von Javas Feuerbergen. Das Tengger-Gebirge und der Vulkan Bromo, 2280 Meter 8 M. Von Dr. med. Franz Kronsecker, Oldenburg und Leipzig, Schulzische Hof-Buchhandlung: A. Schwartz, 1897 (1896). Size 11×7 , pp. 30. *Maps and Illustrations.* *Presented by the Publisher.*
- Malay Archipelago—Java.** **Van der Kemp.**
Bijl. Taal-, Land- en Volkenk. Ned.-Indië (6) 2 (1896): 535-597.
Brieven van den Gouverneur-Generaal van der Capellen over Dipanegara's opstand, zoodaerdat een wederlegging van den Minister Blont. Door P. H. van der Kemp.
- Malay Archipelago—Lombok.** *P.R. Artillery* 1. 23 (1896): 563-595. **White.**
The Dutch Expedition to the Island of Lombok, 1894. By Major W. L. White. *With Map.*
- Malay Archipelago—Sumatra.** *Deutsche G. Mäler* 19 (1896): 137-125. **Zondervan.**
Dwars door Sumatra. Tocht van Padang naar Sink. Von H. Zondervan.
A useful summary in German of the Dutch work by Iserman, van Bemmelen, Koorders, and Bakhuus.
- Malay Archipelago—Sumatra.** **Dijk.**
Tijds. K. Ned. Aardrijksk. Genoot. (2) 13 (1896): 419-426.
Een tochtje per prauw langs Zuid-Samosir van Nalagpolan tot Lotteang en een korte beschrijving van den costelijken over van het Tobo-meer van Si Regar tot Poerba. Door P. A. L. E. van Dijk. *With Map.*
- Persia.** *Nineteenth Century* 41 (1897): 124-131. **Crow.**
English Enterprise in Persia. By Francis Edward Crow.
- Persia.** **Morgan.**
Mission Scientifique en Perse. Par J. De Morgan. Tome Quatrième, Recherches Archéologiques. Première Partie. Paris: E. Leroux, 1896. Size $11\frac{1}{2} \times 9\frac{1}{2}$, pp. xii. and 302. *Illustrations.*
- Philippine Islands.** **Kern.**
Bijl. Taal-, Land- en Volkenk. Ned.-Indië (6) 2 (1896): 729-726.
Spanische beschieden aangaande de Philippijnen. Door Prof. Dr. H. Kern.

Russian Turkestan**Rocca.**

De l'Asie à l'Asie-Mineure. Par Félix de Rocca. Paris: Paul Ollendorff, 1896.
Size 7½ x 5, pp. vi. and 146. Map.

In 1893 M. Rocca travelled by the Trans-Caspian railway to Bokhara and Samarcand, and thence to the Syr-daria and Marghilan, returning by Karateghin, Darwas, and the Ak-su river to the Oxus.

Siberia.**De Windt.**

The New Siberia, being an account of a visit to the Penal Island of Sakhalin, and Political Prison and Mines of the Trans-Baikal District, Eastern Siberia. With Appendices, Map, and Twenty-Eight Illustrations. By Harry De Windt. London: Chapman & Hall, 1896. Size 2½ x 6, pp. xiv. and 324. Portrait. Price 14s.

An account of a visit to the prisons of Eastern Siberia, especially to those of Sakhalin. The island of Sakhalin is popularly supposed to be as inaccessible to European travellers as the city of Lhasa; but Mr. de Windt mentions several English visitors to the island, including one who has resided there for twenty years. An unfavourable report of the eastern section of the great Siberian railway is given.

Siberia.*Rev. G. 39* (1896): 7-18, 88-97, 161-170, 255-266.**Baye.**

Du Volga à l'Urtisch. Par le Baron de Baye. With Map and Illustrations.

Siberian Railway.*Blackwood's Mag.* 161 (1897): 1-29.**Simpson.**

The Great Siberian Iron Road. By J. N. Simpson. With Map.

Siberia—Yakut Country. *Scottish G. Mag.* 12 (1896): 626-636.

The Country of the Yakuts.

An abstract of the Russian memoir by V. L. Seroshovskaya.

Syria—Palestine.*G. Z.* 2 (1896): 241-261, 319-331.**Fischer.**

Palaestina. Eine länderkundliche Studie. Von Theobald Fischer.

Turkish Armenia.*Petersmanns M.* 42 (1896): 292-299.**Saad.**

Zwei türkische Städtebilder aus der Gegenwart. Von Dr. med. L. Saad
1. Erzerum; 2. Trapezunt.

AFRICA.**Congo State.****Droogmans.**

Le Congo. Quatre Conférences Publiques données par M. Hubert Droogmans. (Froisème Edition. Bruxelles: Imp. Van Campenhout [not dated]. Size 10 x 6½, pp. 122. Map. Price 1s. 6d.

The lectures here given were delivered in January and February, 1894, in Brussels. They deal with the Congo from the point of view of Belgian colonial politics, the exploration and resources of the Congo, the people of the Congo basin, and the economic conditions of the natives, together with the political and administrative organization of the Congo Free State.

Congo State.*Rev. G. 38* (1896): 275-285.**Rouire.**

Le Haut Ouhangui et le Gabon. Par le Dr. Rouire.

Eastern Sudan.*Rev. Française* 21 (1896): 610-649.**Barré.**

De l'Ouhangui au Bahr-el-Ghazal: Exploration de la Kéthulle: Exploration Hanolet. Par Paul Barré. With Map.

Egypt.**Brodrick.**

A Handbook for Travellers in Lower and Upper Egypt, including descriptions of the course of the Nile through Egypt and Nubia, Alexandria, Cairo, the Pyramids, Thebes, the First and Second Cataracts, Dongola, the Suez Canal, the Peninsula of Mount Sinai, the Oases, the Fayyum, etc. Ninth Edition, rewritten. Edited by Mary Brodrick, *etc.*, with the assistance of Prof. Sayce and Capt. H. G. Lyons, *etc.* London: John Murray, 1896. Size 7 x 5, pp. [16] and sole, 1905. Maps, Plates, etc. Price 15s. Presented by the Publisher.

This entirely rewritten guide to Egypt must be looked upon as the greatest success of Mr. Murray's series. It is charged with all the information, practical, historical, and scientific, that the tourist or even the travelling student can require. The new maps are models of accuracy and clearness, and the whole 696 pages, and more than a score of maps, together make a volume not exceeding an inch in thickness. The advantage of this thin opaque paper now used for these guides has never been so strikingly shown as in this compact and beautiful volume.

- French West Africa.** *B. Comité l'Afrique Française* 6 (1896): 373-381. **Salleso.**
Une nouvelle voie de pénétration vers le Niger. Par M. le capitaine E. Salleso.
- French West Africa—Timbuktu.** *B.S.G. Marseille* 20 (1896): 302-314. —
Histoire de Tombouctou depuis les origines jusqu'à la conquête Française.
- German South-West Africa.** **Dore.**
Deutsch-Südwest-Afrika. Ergebnisse einer wissenschaftlichen Reise im südlichen Damaraland. Von Dr. Karl Dore. Petermanns Mittheilungen, Ergänzungsheft Nr. 120. Gotha: Justus Perthes, 1896. Size 11 x 7½, pp. 94. *Maps.*
This will be separately noticed.
- German West Africa—Togo.** **Plehn.**
M. Deutsch, Schützgeb. 9 (1896): 117-128.
Bericht über den Verlauf meiner Reise nach Atakpame, Akposso und Kohn. Vom 4 März bis zum 17 April, 1896. Von Lieut. R. Plehn.
- German West Africa—Togo.** *Deutsches Kolonialblatt* 7 (1896): 733-743. —
Ueber eine Reise von Klein-Popo über Loma nach Misaböhe im August, 1894.
- Liberia.** *Liberia, N.* 9 (1896): 1-7. **Cook.**
Who should go to Liberia? By Prof. O. F. Cook.
- Madagascar.** *Nineteenth Century* 41 (1897): 40-53. **Gregory.**
The French in Madagascar. By the Rev. F. A. Gregory.
- Madagascar.** *Globe* 70 (1896): 373-384. **Oppel.**
Die Herkunft der Bevölkerung von Madagascar. Von A. Oppel.
- Madagascar.** *Mission Field* 41 (1896): 442-452. **Smith.**
Madagascar. The Sequel of the War. By the Rev. Alfred Smith. **With**
Illustrations.
- Portuguese East Africa.** **Merleau.**
Missions Catholiques 29 (1896): 487, 512, 524, 535, 545.
La mission du Bas-Zambèze de 1890 à 1895. Par le R. P. J. Merleau. **With Map**
and Illustrations.
- Portuguese West Africa—Angola.** *Scottish G. Mag.* 12 (1896): 560-576. —
The Portuguese in Angola.
- Réunion.** **Oliver.**
Crags and Craters: Rambles in the Island of Réunion. By William Dudley Oliver.
London: Longmans & Co., 1896. Size 8 x 5½, pp. xiv. and 214. *Maps and*
Illustrations. *Price 6s. Presented by the Publishers.*
Réunion is an island so little visited that this book has a much higher value than most works of the kind. We should have been glad of greater detail as to the remarkable railway with its tunnel, which is almost the longest in the world; but the book is well written, and bears the marks of careful compilation, which in no way detracts from the brightness of the narrative.
- Sahara—Reclamation.** *Rev. Scientifique* (4) 6 (1896): 687-690. **Privat-Deschanel.**
Peut-on rebouter le Sahara? Par M. Paul Privat-Deschanel.
- Somali Tribes—Genealogies.** **Cox and Abud.**
Genealogies of the Somal, including those of the Aysa and Gadabursi. By Captain P. Z. Cox. Compiled by authority by Major H. M. Abud. London: Printed by Eyre & Spottiswoode, 1896. Size 13¼ x 8½, pp. xx. and 48. *Presented by the India Office.*
- South Africa.** *G.Z.* 2 (1896): 185-195; 261-278. **Schoenck.**
Die Boerenfreistaaten Südafrikas. Von Dr. Adolf Schoenck. **With Illustrations.**
- South Africa.** **Wilmot.**
Monomotapa (Rhodesia): Its Monuments, and its History from the most Ancient Times to the Present Century. By the Hon. A. Wilmot. *With Preface* by H. Rider Haggard. London: T. Fisher Unwin, 1896. Size 8 x 5½, pp. xxiv. and 260. *Map and Illustrations.* *Price 6s. Presented by the Publishers.*
This book presents the history of the land south of the Zambezi in three periods, as it was known under the Phoenicians, the Arabs, and the Portuguese. It comes down only to 1830, thus avoiding any controversial matter relating to present-day affairs. It

is a work of much research in European libraries, and will be farther referred to in the *Journal*.

South Africa—Rhodesia.

Selous.

Savannah and Storm in Rhodesia, being a Narrative of Events in Matabeleland both before and during the recent Native Insurrection up to the date of the Disbandment of the Bulawayo Field Force. By Frederick Courteney Selous. London: Rowland Ward & Co., 1896. Size 9 x 6, pp. xxviii, and 290. *Map and Illustrations.* Price 10s. 6d. *Presented by the Publisher.*

This will be specially noticed.

South Africa—Transvaal. *National G. Mag.* 7 (1896): 349-367.

Becker.

The Witwatersrand and the Revolt of the Uitlanders. By George E. Becker. *With Illustrations.*

Tunis—Jerba. *A travers le Monde, Tour du Monde, n.s.* 2 (1896): 393-396.

Vincent.

L'Île de Djérba. Par M. Assanry Vincent. *With Illustrations.*

West Africa. *Les Géographes* 10 (1896): 28-29.

Paroisse.

Koudiafara et le Compoay (Rivières du Sud). Par Georges Paroisse.

West Africa—Fanti-land. *J. Anthropol.* 1, 26 (1896): 128-153.

Connolly.

Social Life in Fanti-land. By R. M. Connolly.

West Africa—Guinea.

Azurara.

The Chronicle of the Discovery and Conquest of Guinea. Written by Gomes Eannes de Azurara; now first done into English by Charles Raymond Beazley, M.A., and Edgar Prestage, M.A. Oxon. Vol. I (Chapters i-xi). With an Introduction on the Life and Writings of the Chronicler. London: Printed for the Hakluyt Society, 1896. Size 9 x 6, pp. lxxviii, and 128. *Plates, Presented by the Hakluyt Society.*

The first translation of Azurara's famous Chronicle, which is the chief contemporary authority for the work of Prince Henry the Navigator in promoting the discovery of the West Coast of Africa. The first eleven chapters of the Chronicle are given in this volume, to which is prefixed a critical biography of Azurara.

NORTH AMERICA.

Canada—Geological Survey.

Geological Survey of Canada. G. M. Dawson, O.M.S., etc., Director. Annual Report (New Series). Volume vii. Reports A, B, C, F, J, M, R, S, 1894. Ottawa, 1896. Size 10 x 7. *Maps, Sections, Illustrations.*

This Report contains a great deal of matter of geographical interest, the titles of the various reports included being as follows: A. Summary report of the Geological Survey for 1894. B. On the area of the Kamloops map-sheet, British Columbia, by Dr. Dawson. C. On an exploration of the Finlay and Omineca rivers, by R. G. McConnell. F. On the country in the vicinity of Red Lake and part of Berens's river, Keewatin, by D. B. Dowling. J. On a portion of the province of Quebec, by R. W. Ellis. M. On the surface geology of eastern New Brunswick, north-western Nova Scotia, and a portion of Prince Edward Island, by R. Chalmers. The other sections refer to mineralogy and mineral statistics.

Canada—Irrigation.

Department of the Interior. General Report on Irrigation and Canadian Irrigation Surveys, 1895. Ottawa, 1896. Size 10 x 7, pp. vi, and 112. *Illustrations, Maps separate.*

Canada—Manitoba.

J. Geology 4 (1896): 811-813.

Tyrrell.

The Gneiss of Lake Agassiz. By J. Barr Tyrrell.

Mexico.

Anuario del Observatorio Astronómico Nacional de Tacubaya para el Año de 1897 formado bajo la dirección del Ingeniero Ángel Anguiano. Año xvii. Mexico, 1896. Size 7 x 4½, pp. 376. *Presented by the Observatory.*

United States.

U.S. Landslides G. 10 (1896): 125-141.

Viala.

Les États-Unis et le Far-West. Par L. Fernand Viala.

United States—Alaska. *B. Americana G.S.* 23 (1896): 217-228.

Russell.

Mountaineering in Alaska. By Israel C. Russell. *With Map.*

- United States—Alaska.** *National G. Mag.* 7 (1896): 345-346. **Cantwell.**
Ice-cliffs on the Kowak River. By Lieut. J. C. Cantwell.
- United States—California.** *Appalachia* 6 (1896): 164-173. **Solemons.**
The Grand Cañon of the Tuolumne. By Theodore S. Solemons. *With Map and Illustrations.*
- United States—California.** *National G. Mag.* 7 (1896): 317-327. **Perkins.**
California. By the Hon. George C. Perkins.
- United States—Delaware River.** *J. Franklin I.* 142 (1896): 401-436. **Athes.**
The Improvement of the Channel of the Delaware River. By Walter Athes. *With Illustrations.*
- United States—Florida.** *National G. Mag.* 7 (1896): 381-394. **MacGonigle.**
The Geography of the Southern Peninsula of the United States. By the Rev. John N. MacGonigle. *With Illustrations.*
- United States—Niagara.** *J. Franklin I.* 142 (1896): 287-302, 354-366. **Martin.**
Niagara on Tap. By T. Commerford Martin. *With Illustrations.*
On the utilization of the energy of Niagara Falls by means of electricity.
- United States—Oregon.** *National G. Mag.* 7 (1896): 395-404. **Coville.**
The Sage Plains of Oregon. By Frederick V. Coville.
- United States—Sand-storms.** *Rev. Scientifique* (4) 6 (1896): 717-721. **Udden.**
Les orages de sable et de poussière aux États-Unis. Par M. J. A. Udden.
- United States—Washington Observations.**
Astronomical, Magnetic, and Meteorological Observations made during the year 1890 at the United States Naval Observatory. Capt. Frederick V. McNair, U.S.N., Superintendent. Washington, 1895. Size 12 x 9½, pp. lxxvi, 100, 58, lxxvii, and 420. *Plata.*

CENTRAL AND SOUTH AMERICA.

- Bolivia.** *Aus allen Weltteilen* 28 (1896): 155-160. **Nusser-Aspert.**
Kolonisationsprojekte der bolivianischen Regierung. Von Chr. Nusser-Aspert.
- Cape Horn.** *Nautical Mag.* 66 (1896): 51-63. **Allingham.**
Doubling Cape Horn. By William Allingham. *With Chart.*
A sketch of some historical roundings of Cape Horn, and observations on the present conditions of accomplishing it.
- Central America.**
No. 61 [U.S.], Hydrographic Office. The Navigation of the Gulf of Mexico and Caribbean Sea. Vol. II, Third Edition. The Coast of the Mainland from Key West, Florida, U.S., to the Orinoco River, Venezuela, with the adjacent Islands, Bays, and Banks. Washington, 1896. Size 9½ x 6, pp. 490. *Chart and Diagrams. Presented by the U.S. Hydrographic Office.*
- Chile.** *B.S.G. Barcelona* 1 (1896): 21-28. **Cabrinetty.**
La bahía de Concepción y el puerto y ciudad de Talcahuano. Por D. Manuel Cabrinetty.
- Chile.** **Kröger.**
Ueber die Ausführung einer topographischen Landesaufnahme von Chile. Von Paul Kröger. Valparaiso: G. Helfmann, 1896. Size 9½ x 6½, pp. 36. *Presented by the Author.*
- Chile.** **Kröger.**
Die barometrische Höhenmessung des Bio Puelo Thals in Süd-Chile. Von Dr. Paul Kröger. Valparaiso: G. Helfmann, 1896. Size 10 x 6½, pp. 26. *Presented by the Author.*
- Chile—Chilo.** **Maldonado.**
Informe preliminar relativo á la Exploracion Hidrográfica de la costa de Chilo. Por Roberto Maldonado C. Santiago de Chile, 1896. Size 6½ x 4½, pp. 26.
- Chile—Juan Fernandez.**
Informe de la Comisión nombrada para estudiar la Colonización de Juan Fernandez.—Memoria del Ministro de Colonización presentada al Congreso Nacional en 1895. Pp. 225-344. *Maps.* Santiago, 1896. Size 10 x 7.

Chile—Magallanes.

Sabot.

Memoria del Gobernador de Magallanes.—Memoria del Ministro de Colonizacion presentada al Congreso Nacional en 1895. Pp. 165-225. Santiago, 1895. Size 10 x 7.

Chile—Palena.

Rossier.

Memoria del Inspector de la Colonia de Palena.—Memoria del Ministro de Colonizacion presentada al Congreso Nacional en 1895. Pp. 347-353. Santiago, 1895. Size 10 x 7.

Nicaragua.

Globe 70 (1896): 181-184.

Lersch.

Elne Fahrt auf dem Principepsen und Bananabuss (Nordost-Nicaragua). Von Dr. Otto Lersch. *Wald Illustration*.

Paraguay.

La Géographie 9 (1896): 449-451.

Machon.

Les Calingua. Voyage du Docteur Machon à travers le Paraguay, mai, juin et juillet 1891.

Peru.

B.S.G. Lima 5 (1895): 121-203, 241-266.

Raimondi.

Itinerario de los viajes del Dr. Raimondi en el Perú. De Lima á las montañas de Huancayo, Tarma, Pampa de Junin y Cerro de Pasco; De Huanta á Lima por el camino de Huancavelica (1893); Montañas de Huancayo y regreso á Lima. 1895.

Peru—Hydrography.

B.S.G. Lima 5 (1895): 301-317.

Osambela.

Hidrografia Peruana. Su importancia por Claudio Osambela.

Peru—Tarma.

B.S.G. Lima 5 (1895): 200-227.

Carranza.

Estado de Geografia descriptiva y datos estadisticos de la provincia de Tarma. Por D. Albino Carranza.

San Domingo—Birds.

Cherrie.

Field Columbian Museum. Publication 10. Ornithological Series. Vol. I. No. 1. Contribution to the Ornithology of San Domingo. By George K. Cherrie. Chicago, 1896. Size 10 x 6½, pp. 20.

San Salvador.

XV. Jahresh. G. Ges. Bern (1896): 125-128.

Hegg.

Mittheilungen aus Salvador. Von Dr. Hegg.

S. Atlantic—Trinidad.

Rev. Trin. I.G. e Hist. Bahia 3 (1896): 185-193.

A Ilha da Trinidade e os Rochedos de Martin Vaz.

Tierra del Fuego.

G.Z. 2 (1896): 362-374.

Nordenkjöld.

Das Feuerland und seine Bewohner. Von Dr. Otto Nordenkjöld.

Dr. Nordenkjöld's account of his recent expedition to the southern extremity of South America.

AUSTRALASIA AND OCEANIC ISLANDS.**New South Wales. J. and P.R.S. New South Wales 20 (1895): 492-499.**

Kiddle.

Notes on the Rainfall of the Southern Riverina, 1872 to 1894. By Hugh Charles Kiddle.

New South Wales.

Russell.

A Map showing the average Monthly Rainfall in New South Wales. By H. C. Russell. [Read before the Royal Society of N.S. Wales, November 7, 1894.] Size 2 x 5, pp. 4. Map. Presented by the Author.

This is a statistical diagram, the figures of rainfall being printed on the map without any attempt to draw lines of equal rainfall.

New South Wales.

Bladen.

Historical Records of New South Wales. Vol. iv.—Hunter & King. 1800, 1801, 1802. Edited by F. M. Bladen. Sydney: C. Potter, 1896. Size 9 x 6, pp. xiv. and 1006. Presented by the Agent-General for New South Wales.

This carries the official history of the colony from 1800 to 1802. The record contains much interesting material as to early exploration in Australia, as well as to the troubles and blunders of the administration. A number of original letters are reproduced in facsimile.

New South Wales.

Hutchinson, etc.

New South Wales: "The Mother Colony of the Australias." Edited by Frank Hutchinson. 1894. Sydney: C. Potter, 1896. Size 10 x 6½, pp. xii. and 370.

Maps, Plan, and Illustrations. Presented by the Agent-General for New South Wales.

A collection of thirty-seven well-illustrated articles by various authors dealing with every aspect of New South Wales—its geography, resources, trade, and industries; its political constitution, social, religious, and educational conditions, literature and art, railways, telegraphs, and public works. It says a great deal for the enlightenment of the colonial government that a book giving such full and authoritative information has been published in such an attractive form.

New Zealand.

Buller.

The Horowhenua Commission. Address of Sir Walter Buller, K.C.M.G., as Counsel for Major Kemp Te Rangihituni, and the Munapoko Tribe. April, 1896. Wellington: Printed by R. Coupland Harding, 1896. Size 10 x 6½, pp. 34. *Presented by Sir Walter Buller.*

New Zealand.

J.R. Colonial I. 27 (1896): 516-533.

Reeves.

The Fortunate Isles; Picturesque New Zealand. By the Hon. W. P. Reeves.

New Zealand.

Smith.

Report of the Department of Lands and Survey, New Zealand, for the year 1895-96. By Stephenson Percy Smith, Surveyor-General. Wellington, 1896. Size 12½ x 8½, pp. 11, and 192. *Maps and Plates.*

This report is a valuable geographical document reflecting the greatest credit on the New Zealand Government, their surveyors and draftsmen. The maps are much above the usual standard of illustrations to official reports.

New Zealand—Dusky Sound. T. and P. New Zealand I. 28, 1897 (1896): 50-54. Henry.

On Dusky Sound. By Richard Henry.

New Zealand—Forests. T. and P. New Zealand I. 28, 1897 (1896): 147-163. Hamilton.

On the Forests of New Zealand. By A. Hamilton.

New Zealand—Historical. T. and P. New Zealand I. 28, 1897 (1896): 117-140. Hocken.

Abel Tasman and his Journal. By Dr. T. M. Hocken. *With Map.*

The author states that this is the first time that Tasman's journal of the discovery of New Zealand has been fully translated. The log is prefaced by a brief biography and a sketch of the conditions of exploration in his time.

New Zealand—West Coast. New Zealand Alpine J. 2 (1896): 143-159.

Harper.

West Coast Exploration, 1894-95. By Arthur P. Harper.

Queensland. P. and T. Queensland Br., N.G.S. Australasia II (1896): 46-61. Boyd.

Narrative of Captain G. Pennicfather's Exploration of the Owen, Archer, and Bates Rivers, and of the Islands on the Western Coast of the Gulf of Carpentaria in 1880. By Major A. J. Boyd.

Rotuma.

Allen.

Rotuma. By the Rev. W. Allen.—Report of the Sixth Meeting of the Australasian Association for the Advancement of Science, held at Brisbane, Queensland, January, 1895. Sydney. Size 9 x 6, pp. 569-570. *Map.*

This gives a map of the island and some interesting particulars as to the customs of the people.

MATHEMATICAL GEOGRAPHY.

Geodesy.

Hirsch.

Comptes-rendus des séances de la Onzième Conférence Générale de l'Association Géodésique Internationale et de sa Commission Permanente réunies à Berlin du 25 Septembre au 12 Octobre, 1895, rédigés par le Secrétaire perpétuel A. Hirsch, publiés par la Commission Permanente de l'Association Géodésique Internationale. IV. Volume: Rapports spéciaux sur les progrès de la Mesure de la Terre et Rapports des Délégués sur les travaux géodésiques accomplis dans leurs pays. Berlin: G. Reimer, 1896. Size 12 x 9, pp. 466. *Maps and Diagrams.*

Contains a large number of valuable maps, showing the present position of geodesic surveys in Europe, and in various countries.

Geodesy.

Rev. Scientifique (4) 6 (1896): 622-625.

Gaullier.

Le Méridiennaire et la détermination du niveau des mers, d'après M. Ch. Lallemand. Par Paul Gaullier. *With Illustrations.*

Globes.**Pomba.**

Sur la construction des Globes. Par Cesare Pomba, Turin. Extrait des Comptes-rendus du Sixième Congrès International de Géographie tenu à Londres en Juillet, 1895. Size 10 x 6½, pp. 6.

Gravity Discussions.**Hergesell.**

Das Clairaut'sche Theorem. Von H. Hergesell.—Beiträge zur Geophysik. Herausgegeben von Prof. Dr. Georg Gerland. III. Band. 1 Heft. Pp. 34-55. Leipzig: W. Engelmann, 1896. Size 9¼ x 6.

Map-projections.*J. Manchester* (S.S. 11, 1895 (1896): 232-247.**Reed.**

The Elements of Map-Projection. By Mr. J. Howard Reed. With Illustrations. An elementary résumé.

Mathematical Geography.**Günther.**

Grundlehren der mathematischen Geographie und elementaren Astronomie für den Unterricht. Bearbeitet von Dr. Siegmund Günther. Vierte Auflage. München: T. Ackermann, 1896. Size 8½ x 6, pp. x. and 144. Maps. Price 2s.

The fourth edition of a very compact and well-arranged little treatise on mathematical geography, including so much practical astronomy as is necessary for the comprehension of the methods of fixing positions on the Earth's surface, and for understanding the phenomena of day and night, the seasons, tides, and the calendar.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.**Aurora Australis.****Boller.**

Das Südlicht. Von Dr. W. Boller. Erste Abhandlung.—Beiträge zur Geophysik. Herausgegeben von Prof. Dr. Georg Gerland. III. Band. 1 Heft. Pp. 56-120. Leipzig: W. Engelmann, 1896. Size 9¼ x 6. Map.

Geomorphology.**Günther.**

"Hylökinese," eine Vorläuferin der terrestrischen Morphologie. Von S. Günther.—Beiträge zur Geophysik. Herausgegeben von Prof. Dr. Georg Gerland. III. 1 Heft. Pp. 19-53. Leipzig: W. Engelmann, 1896. Size 9¼ x 6.

Geomorphology.*G.Z.* 2 (1896): 512-527, 537-570, 626-639, 688-703.**Phillipson.**

Die Morphologie der Erdoberfläche in dem letzten Jahrzehnt (1855-1894). Von Dr. Alfred Phillipson.

A summary of work bearing on the physical features of the Earth's crust, published during the last ten years.

Gravity Observations.**Schmidt.**

Die Aberration der Latholite. Von Dr. A. Schmidt.—Beiträge zur Geophysik. Herausgegeben von Prof. Dr. Georg Gerland. III. Band. 1 Heft. Pp. 1-15. Leipzig: W. Engelmann, 1896. Size 9¼ x 6.

Great Ice Age.*G. Tidsskrift* 12 (1896): 163-168.**Velschow.**

Om Aarsagen til Istiden. Af F. A. Velschow. With Map.

On the causes of the Ice Age.

Lakes.*M.G. Ges.* Wien 39 (1896): 638-672.**Fuggér.**

Die Hochseen. Von Eberhard Fuggér.

On mountain lakes.

Meteorology.*C. Bl.* 123 (1896): 922-932.**Crova and Hondaille.**

Déterminations aethnométriques faites au Mont Blanc. Note de MM. Crova et Hondaille.

Meteorology.*B.S. Khellie, G.* 4 S. (1896): 603-633.**Franceschi.**

Lo Urepuscula à Alexandria. Par le Dr. Eugène Franceschi.

An account of the sunset appearances on the edge of the tropical zone.

Meteorology.**Jourdanet.**

Influence de la Pression de l'Air sur la vie de l'homme. Climats d'altitude et climats de montagne. Par D. Jourdanet. Deuxième Edition. Paris: Vigot Frères [not dated]. Size 11¼ x 8, pp. 654. Maps and Plates.

A general account of the atmosphere and its influence on mankind.

Meteorology.*Appalachia* 5 (1896): 179-189.**Rotch.**

The Exploration of the Air. By A. Lawrence Rotch. With Illustrations. An account of some high-level observations.

- Meteorology.** *Nautical Mag.* 65 (1896): 1007-1102. **Scott.**
 International Meteorological Conferences. By Robert H. Scott, R.N.A.
- Meteorology.** **Waldo.**
 Elementary Meteorology for High Schools and Colleges. By Frank Waldo, M.D.
 New York: American Book Company, 1896. Size 7½ x 5½, pp. 374. Maps and
 Illustrations. Price \$1.50. Presented by the Publishers.
 An excellent little book, very well illustrated, "creditable alike to the talent
 and application of the author and the enterprise of the publishers," to quote the conclusion
 of a printed notice forwarded with the book and apparently meant for publication.
 The same notice states that it is "a pioneer work in this new field," i.e. meteorology
 as a subject for schools and colleges, but this statement obviously applies only to works
 published in the United States.
- Meteorology and Oceanography.**
 Achtzehnter Jahres-Bericht über die Thätigkeit der deutschen Seewarte für das
 Jahr 1895. Erstattet von der Direktion. Beiheft I. zu den "Annalen der Hydro-
 graphie und Maritimen Meteorologie," 1896. Hamburg, 1896. Size 11 x 8, pp.
 iv, and 38.
 The official record of the valuable work done in meteorology, oceanography, and
 terrestrial physics by the German Marine Observatory under Dr. Neumayer.
- Oceanography.** *Nature* 55 (1896): 89-90. **Cleve.**
 Microscopic Marine Organisms in the Service of Hydrography. By Prof. P. T.
 Cleve.
- Oceanography.** *Nineteenth Century* 40 (1896): 881-895. **Crouch.**
 The World beneath the Ocean. By Archer P. Crouch.
 Mr. Crouch's paper is of a character rarely seen in the *Nineteenth Century*. It con-
 tains several somewhat serious errors, and fails to direct attention to the most remark-
 ably recently ascertained facts of sub-oceanic terrestrial relief, although several pages
 of slightly adapted quotation from the Challenger Narrative and other unacknow-
 ledged authorities show that the author was not unacquainted with sound sources of
 information.
- Oceanography.** *Ann. Hydrographie* 24 (1896): 463-466. **Knudsen.**
 Ueber das Abhängigkeitsverhältnisse zwischen dem Sauerstoff- und dem Kohlen-
 säuregehalt des Meerwassers und dem Plankton des Meeres. Vorläufige Mitthei-
 lung des Physikers der Ingulf-Expedition Martin Knudsen.
- Oceanography.** *C. Rd.* 123 (1896): 1001-1003. **Knudsen.**
 De l'influence du plankton sur les quantités d'oxygène et d'acide carbonique
 dissous dans l'eau de mer. Note de M. Martin Knudsen.
 The results of observations on the expedition of the Danish cruiser *Ingulf* was to
 prove that the amount of dissolved carbonic acid in the water showed some relation to
 the quantity of plankton, or surface-swimming organisms.
- Oceanography.** *C. Rd.* 123 (1896): 1043-1046. **Monaco.**
 Sur la troisième campagne scientifique de la *Princesse Alice*. Par S. A. Albert I^{er},
 Prince de Monaco.
 This will be noticed in the Monthly Record.
- Oceanography.** **Pettersson and Ekman.**
Bihang K. Svensk. Vetensk.-Ak. Handl. 21 (1895): 1-66.
 Rönslörelse för de svenska hydrografiska undersökningarna åren 1892-1894.
 Under ledning af G. Ekman, O. Pettersson och A. Wikander. IV. Yrvidnats
 tillstånd i Nordjön och Skagerrack under olika årstider. Af O. Pettersson och
 G. Ekman. With Maps.
 On the temperature and salinity of the Skagerrack and coast of Sweden.
- Oceanography—Tides.** *Ann. Hydrographie* 24 (1896): 354-366. **Horn.**
 Ueber die Form und den Ursprung der Gezeitenwellen. Von Baumister von Horn.
- Seismic Observations.** **Ehrlert.**
 Horizontalpendelbeobachtungen im Meridian zu Strassburg L. E. Von April bis
 Winter 1895. Von Reinhold Ehrlert.—Beiträge zur Geophysik. Herausgegeben
 von Prof. Dr. Georg Gerland. III. Band 1. Heft. Pp. 181-215. Leipzig
 W. Engelmann, 1896. Size 1½ x 6.
- Soll Erosion.** *National G. Mag.* 7 (1896): 368-377. **Shaler.**
 The Economic Aspects of Soll Erosion. II. By Dr. N. S. Shaler.

NEW MAPS.

By J. Colles, Map Curator, R.G.S.

EUROPE.

England and Wales.

Ordnance Survey.

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(E. Stanford, Agent.)

Europe.

Poole.

Historical Atlas of Modern Europe from the Decline of the Roman Empire: comprising also maps of parts of Asia and of the New World connected with European History. Edited by Reginald Lane Poole, M.A., F.R.S., Lecturer in Diplomatic in the University of Oxford. Part III. Oxford: The Clarendon Press; London, Edinburgh, and Glasgow: Henry Frowde; Edinburgh: W. & A. K. Johnston. 1897. Price 2s. 6d. Presented by the Clarendon Press.

Part III. of this atlas continues: Plate 29, England and Wales, showing the Parliamentary Representations down to the Reform Bill of 1832. Plate 35 is a map of Scotland, c. 1300, with two insets, one, Early Scotland, and another, Scotland in the Eleventh Century. Plate 32 is a map of the Frankish Dominions in Merovingian Times, 486-768, with four small insets. With each map there is accompanying letter-press.

French Lakes.

Delabesque.

Atlas des Lacs Français. Pl. 11. Principaux Lacs du Département des Vosges, levés en 1893. Par A. Delabesque, Ingénieur des Ponts et Chaussées. J. Magnin, Comma. Scale 1: 10,000 or 0.23 inches to a stat. mile. Ministère des Travaux Publics. Paris. Presented by M. A. Delabesque.

This is plate No. 11 of M. A. Delibecque's atlas of the French Lakes, and contains maps of Lac de Longemer, Lac de Gérardmer, Lac des Corbeux, and Lac de Retournemer. They are all drawn on a uniform scale of 1:10,000, contoured and coloured with different shades of blue according to their depth. The points where soundings were taken are indicated by dots.

Germany.**Kgl. Preuss. Landes-Aufnahme.**

Karte des Deutschen Reiches. Scale 1:100,000 or 15 stat. miles to an inch. Herausgegeben von der Kartogr. Abtheilung der Kgl. Preuss. Landes-Aufnahme. 1896. Sheets: 273, Schwerin a. d. W.; 299, Tirschtiegel; 402, Erkelenz; 403, Düsseldorf; 428, Aachen. Price 1.50 mark each.

Hungary.**Langhans.**

Verbreitung der Deutschen in den Ländern der Ungarischen Krone nebst Anschluss an die benachbarten österreichischen Länder. Auf Grund der Sprachenzählung von 1890 gemeindeweise bearbeitet von Paul Langhans auf Vögels Karte von Oesterreich-Ungarn in Stollers Hand-Atlas. Scale 1:1,500,000 or 23.8 stat. miles to an inch. Petermann's 'Geographische Mittheilungen,' Jahrgang 1896. Tafel 20. Gotha: Justus Perthes. Presented by the Publisher.

Portugal.**Portuguese Government.**

Carta Chorographica de Portugal. Scale 1:100,000 or 1.6 stat. miles to an inch. Direcção Geral dos Trabalhos Geodesicos do Reino. Sheets 4, 8, 11, 37.

ASIA.**Central Asia.****Futterer.**

Übersichtskarte der wichtigsten Gebirgssysteme von Zentral-Asien und China. Nach den neuesten Forschungen u. älteren Materialien entworfen. Von Dr. Karl Futterer. Scale 1:12,500,000 or 197 stat. miles to an inch. Geologische Profile durch den Thian-Schan, den Westlichen, mittleren u. östlichen Kuen-Lun und das Hinterindische Gebirgssystem. Zusammengestellt von Prof. Dr. K. Futterer. Petermann's 'Geographische Mittheilungen,' Ergänzungsheft No. 119. Taf. 1 u. 2. Gotha: Justus Perthes, 1896. Presented by the Publisher.

AFRICA.**German S.W. Africa.****Dore.**

Dr. Karl Dore's Reisekarte zwischen dem Khouas-Gebirge und dem Swakob-Thal (Deutsch-Südwest-Afrika). Nach eigenen Aufnahmen. Scale 1:500,000 or 7.9 stat. miles to an inch. Petermann's 'Geographische Mittheilungen,' Ergänzungsheft No. 120. Gotha: Justus Perthes, 1896. Presented by the Publisher.

Morocco.**Flotte de Roquevaire.**

Carte de Maroc dressée par R. de Flotte de Roquevaire, Membre de la Société de Géographie. Scale 1:1,000,000 or 15.8 stat. miles to an inch. Paris: Maison Andrieux-Goujon. Henry Barrère, Editeur, 1897. 2 sheets. With letterpress. Presented by the Publisher.

From the list of authorities given as having been consulted in the compilation of this map, it seems that every care has been taken to make it as complete as possible, while the map itself appears to be an excellent example of painstaking work. The routes followed by all well-known travellers, together with the date at which each journey was made, are shown, and several enlarged plans of places of importance are given as insets. The map is very nicely drawn, the hill shading is in brown and very effective, all the water is in blue, and the lettering remarkably clear. A pamphlet accompanies the map, in which the author gives some useful information.

Tunisia.**Service Géographique de l'Armée.**

Tunisie. Scale 1:200,000 or 3.1 stat. miles to an inch. Dressé, gravé et publié au Service Géographique de l'Armée. Paris. Price 70 c.

AMERICA.**New York.****Geological Survey of the State of New York.**

Preliminary Geologic Map of New York, exhibiting the structure of the State as far as known. Prepared under the direction of James Hall, state geologist, by W. J. McGee. Published by authority of the Legislature of the State of New York. Printed by the United States Geological Survey. J. W. Powell, director. Scale 1:316,800 or 5 stat. miles to an inch. 6 sheets. Presented by the U.S. Geological Survey.

GENERAL.

Exploration.

Schrader.

l'Année Cartographique. Supplément Annuel à toutes les Publications de Géographie et de Cartographie. Dressé et rédigé sous la direction de F. Schrader, directeur des travaux cartographiques de la Librairie Hachette et C^e. Sixième Supplément contenant les Modifications Géographiques et Politiques de l'Année, 1895. Paris: Librairie Hachette et C^e. 1896. Price 3 fr.

The first sheet, Asia, of this useful atlas contains a map of Western Yunnan, Upper Burma, and the Shan States, showing the routes followed by Prince Henri D'Orléans, and MM. Eudie Roux and Briffaut; it also contains a map illustrating Mr. St. G. R. Little's journey across Tibet, and another of Indo-China and Siam, on which the boundaries are shown according to the latest treaties. The second sheet, Africa, is occupied by a map of the country in the neighbourhood of Timbuctu, from the surveys of Lieutenants Hourst and Bluzet; a map of the country between the Congo, Benue, and Shari; a map of the mineral region of South Africa to illustrate development of the railways; and a map of the Guinea Coast and the country in the head of the Niger. The third sheet, America, contains a map showing Mr. A. P. Low's explorations in Labrador; a map illustrating Mr. J. B. Tyrrell's explorations in Northern Canada; a map of the Province of Catamarca and the Chilo-Argentine boundary, and a railway map of the Argentine Republic. The maps are accompanied by explanatory notes, which are printed on the back of each of them.

Facsimile Maps.

Miller.

Mappeemundi. Die ältesten Weltkarten. Herausgegeben und erläutert von Dr. Konrad Miller, Prof. am K. Realgymnasium in Stuttgart. V. Heft: Die Elbstorf-karte. Stuttgart. Jos. Roth'sche Verlagshandlung, 1890.

This is the fifth part of Dr. Konrad Miller's interesting facsimile series of some of the oldest maps of the World. The present issue is a reduction of the now well-known Elbstorf map, and is printed in colours. A former reproduction of this map was noticed at length in the *B.G.S. Proceedings*, 1892, p. 64. In the present instance Dr. Miller gives, in the form of a book, a full account of the map, together with the names of places, and all the legends which appear on it.

The World.

Spamer.

Spamers grosser Hand-Atlas in 150 Kartenseiten nebst alphabetischem Namenverzeichnis. Hierzu 150 Folia-Seiten Text enthaltend eine geographische, ethnographische und statistische Beschreibung aller Theile der Erde von Dr. Alfred Hettner, a. o. Prof. an der Universität Leipzig. Mit ca. 600 Karten, Plänen und Diagrammen. Leipzig. Verlag von Otto Spamer. Price 20 marks.

The plan of this atlas is identical with that of Schrader's *Atlas de Géographie Moderne*, and a comparison shows that the same plates have been used. In addition, however, to those, others have been added, and the bulk of the atlas much increased. As in Schrader's atlas, each map is accompanied by explanatory notes, illustrated in the text with numerous small maps and plans, which add considerably to its value.

The World.

Hartleben.

A. Hartleben's kleiner Welt-Atlas. 24 Hauptkarten und 30 Nebenkarten auf 40 Kartenseiten. Mit einem helfenden Texte von Professor Dr. Friedrich Umlauf. Wien, Pest, Leipzig. A. Hartleben's Verlag. Price 2 fl.

This is a popular atlas, in which space is economized by printing the letterpress on the reverse of the maps. It is a useful atlas for general reference for those who are able to read the notes, which are, of course, in German.

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

MAP OF PART OF THE KINGDOM of the MARUTSE,

from Surveys & Explorations by
CAPT. ALFRED ST HILL GIBBONS,
MR. PERCY C. REID,
and Capt. Bertrand.
1895-1896.

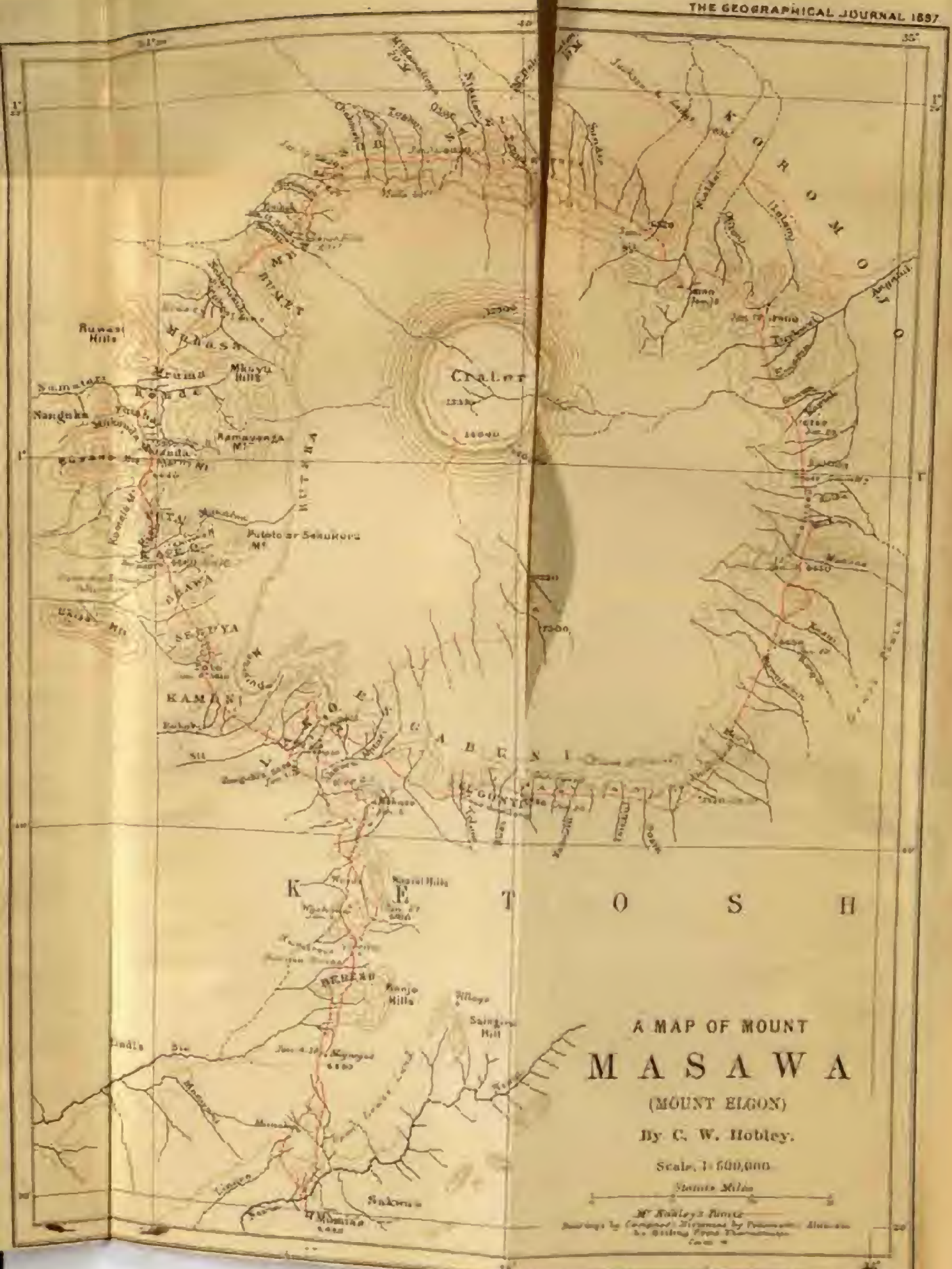
Scale—1:1,000,000.

Statute Miles

— Capt. Gibbons' Route.
— Mr. Reid's Route. — Capt. Bertrand's Route.
All Latitudes determined by Capt. Gibbons and Mr. Reid
have been inserted upon the Map.
Information derived from previous Explorers has been placed
within brackets.







A MAP OF MOUNT
MASAWA
(MOUNT ELGON)

By C. W. Hobley.

Scale, 1:500,000

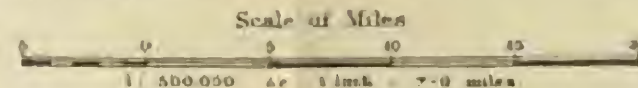
Scale in Miles

Mount Masawa
Drawings by C. W. Hobley. Photographs by F. W. Hobley. Illustrations by G. W. Hobley. Printed by G. W. Hobley.



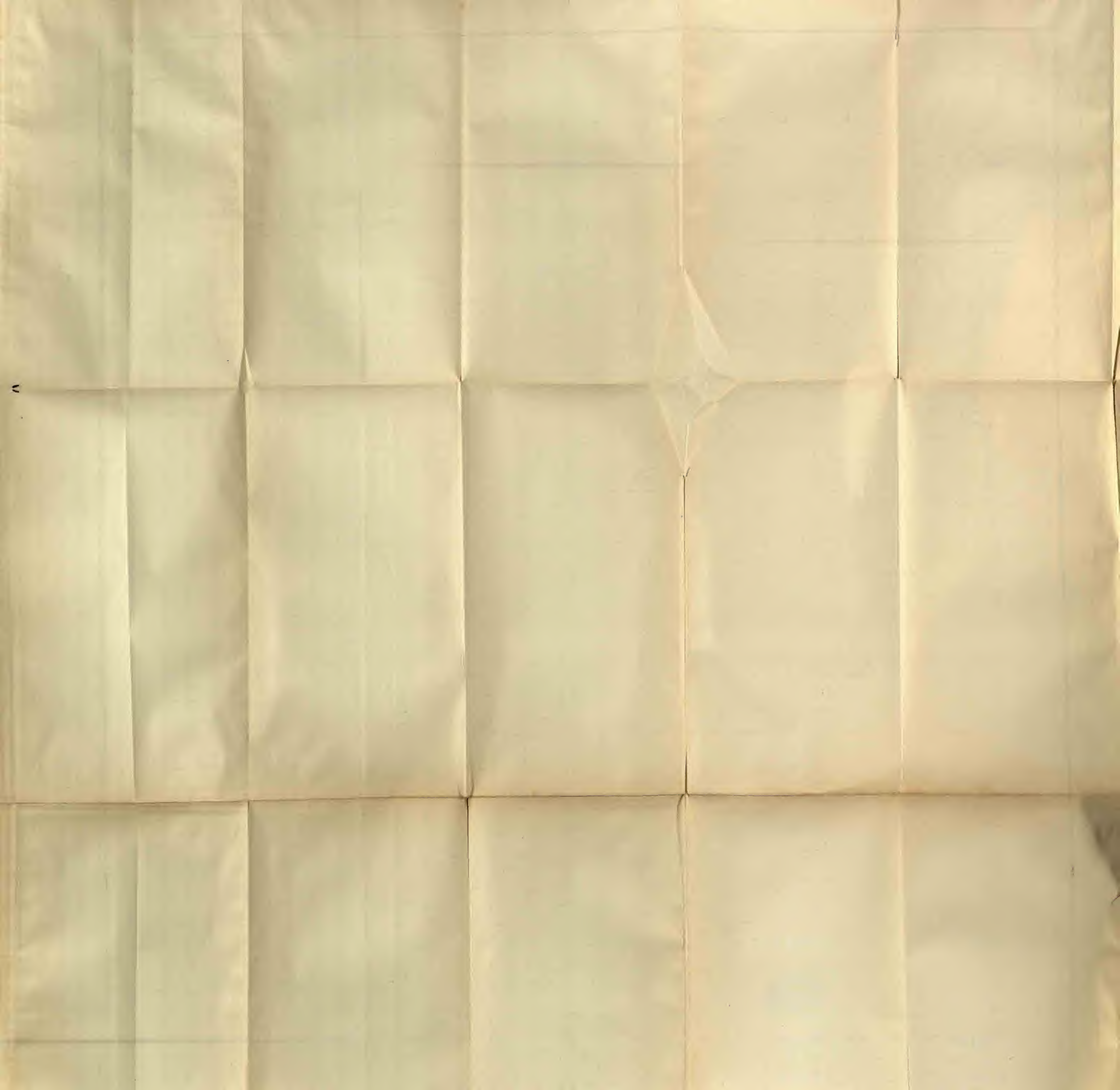
MAP OF
THE NIGER DELTA.

Reduced from documents of the Royal Niger Company
The Intelligence Department W.O. including the Surveys of
Major Copland Crawford and Cap^t. H.L. Gallwey.



MOUTHS OF THE R. KWARA OR NIGER

Longitude East





Photograph by Nettie, Christiania, 1896.

Swiss Electric Engineering Co

Kristian Hansen

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VOL. IX.

THE NANSEN MEETING IN THE ALBERT HALL.

PRESENTATION OF THE SPECIAL MEDAL.

ON Monday, February 8, an audience of about 7000 Fellows and their friends assembled in the Albert Hall, to welcome Dr. Nansen, listen to the story of his remarkable enterprise, and witness the presentation of the special gold medal awarded by the Council. The President, Sir Clements Markham, K.C.B., occupied the chair. On his right was the Prince of Wales, Vice-Patron of the Society; and on his left the Duke of York, Hon. President. At the table were seated Dr. Nansen and Lieut. Scott-Hansen (one of the scientific staff of the *Fram*), Sir Leopold McClintock, and Sir George Nares. On the platform, besides the Vice-Presidents and Council, were several foreign ambassadors and ministers, the President of the Royal Society, a number of the British arctic explorers, and other distinguished men. The reception which Dr. Nansen met with was of the most enthusiastic character. He held the close attention of the audience for nearly an hour and a half, while he told, without the assistance of manuscript, his story of the *Fram* and of the venture of himself and Lieut. Johansen. The story was illustrated with a series of about fifty slides projected on the screen, partly from photographs and partly from Dr. Nansen's own coloured sketches. They were admirably executed, clear, and effective, and illustrated in a striking manner the scenes in the midst of which the expedition spent three years, and some of the incidents that occurred. The address was listened to with the closest attention, and enthusiastically applauded. As it was the lecture which Dr. Nansen is delivering over the Kingdom during February and March, we do not publish it here. In an early number of the *Journal* an account of some of the scientific results of

the expedition, specially prepared by Dr. Nansen for the Society, will be published, with maps and illustrations.

The President introduced Dr. Nansen as follows:—

"Your Royal Highnesses, Fellows of the Society, and Guests. The minutes of the last meeting will not be read: the list of Fellows elected to-day will be read another time, and I trust these irregularities will be excused. The thousands of guests who have honoured us by



COLIN ARCHER, BUILDER OF THE *PRIN*.

(From "*Northeast North*," by permission of Messrs. A. Constable & Co.)

accepting our invitation for this meeting, combined with ourselves, form a vast assembly. The presence of such an assembly is a proof, if proof were needed, of the great interest which is taken by all Britons in the magnificent geographical achievement of our Norwegian colleague and gold medallist. Nansen is an old friend. He was with us after he returned from his splendid Greenland exploit; he was with us when he came to tell us his plans for exploring the unknown region. This Society wished him a hearty God-speed, and I for one never doubted that he would return, and that he would return successful.

His great ability and resourcefulness, his great scientific knowledge, his marvellous powers of endurance, above all, those high qualities by which he made himself loved by all his followers, were the guarantees of that success. We shall often think of these guarantees as we listen to what the great explorer is about to tell us. I call upon Dr. Nansen to address the meeting."

After the address :—

Admiral Sir LEOPOLD M'CLINTOCK said : "Your Royal Highnesses, Mr.



CAPTAIN OTTO EVERDOUT.

(From a photograph by Smarinski, Christiania.)

President, my lords, ladies, and gentlemen,—As one of the senior arctic officers of this country, I have been entrusted by his Royal Highness the Prince of Wales, with the honour of proposing a vote of thanks to Dr. Nansen, and in so doing I am but the mouthpiece of this vast assembly to give expression to the great interest and admiration with which they have listened to his marvellous lecture; and, although all must admire, only we arctic men who have experienced the hardships of

that peculiar service can thoroughly appreciate the magnificent courage and endurance of Nansen and his companions, and we arctic men are so favourably impressed by Nansen's genius and fortitude that we have determined to give expression to our high approval and admiration in the shape of a special presentation. Your Royal Highness, I beg to propose that we offer our very best thanks to Dr. Nansen for the address which he has delivered."

Admiral Sir GEORGE NARES said: "I have the greatest pleasure in



LIUTENANT EDWARD SCOTT-NANSEN.

(From a photograph by Szmielek, Krakow.)

seconding the vote of thanks to Dr. Nansen for his so very modestly related story of the experiences, privations, and dangers undergone by himself and his companions during the daring and adventurous voyage of the *Fram*.

"In successfully drifting across the Arctic Sea with the vessel frozen in the ice in so short a time, Dr. Nansen has satisfactorily proved that his bold idea of so continuing polar exploration, which received our outspoken but friendly criticism a little more than four years ago,

was thoroughly well conceived in every respect. The facts which he has established, as to the northern termination of Franz Josef Land, the great depth of the Arctic Sea, and that the ice in this part, instead of being of a solid and paleocrystic character some 100 feet in thickness, as we had reason to expect, cannot be more than some four or five years old, the time taken to drift across from one side to the other, are of the greatest importance in connection with further exploration.



DR. HENRIH HJESING.

(From a photograph by Sæviak, Christiania.)

"Having assured himself that the *Fram* was drifting steadily homeward, Nansen's decision to leave her comfortable quarters and make a dash for the pole, with Johansen as his sole companion, having Spitzbergen and Franz Josef Land as their only base, is far and away the most remarkable display of plucky self-confidence in arctic records. The conception of so unprecedented a journey can only be compared with that of his own previous trip across Greenland in 1888, when he practically burnt his boats behind him, and, with no possible means of

retreat, successfully completed his journey by ever pushing boldly forward.

"Their Eskimo-like life for so many months on their retreat to Franz Josef Land, subsisting on their own resources somehow or other, in the manner he has related to us, is a most wonderful achievement, and the literally true story of this fine display of manhood, obstinate tenacity of purpose, and readiness of resource under the most extreme circumstances will be, we may be sure, for ages to come, a favourite and



LIEUTENANT HJALMAR JOHANSEN.

(From a photograph by Samuelsen, Christiania.)

valuable gift-book to the rising generations. We may truly say of Nansen, 'None but himself could be his parallel.'

"It is very evident, from the accounts that we have received, that the officers and crew of the *Fram* were worthy of their leader. Owing to their nearness to the pole, their winters were longer and darker than ever before experienced by man. The fact of being out of sight of land throughout their three years must have been, to a certain extent, depressing; but, on the other hand, the fairly continuous drift of the ice-



SPECIAL MEDAL AWARDED BY
THE ROYAL GEOGRAPHICAL SOCIETY TO
DR. NANSEN.

bound vessel in a homeward direction must have exercised a very cheering effect on one and all.

"As Sir Leopold M'Clintock has stated, all the British arctic explorers join in heartily congratulating Dr. Nansen and his shipmates on their brilliantly successful voyage, by means of which, in addition to their having reached within 226 miles of the pole, 170 miles nearer than any former travellers, our knowledge of the polar regions has been vastly increased."

The PRESIDENT: "It has been proposed by Sir Leopold M'Clintock, and seconded by Sir George Nares, that a cordial vote of thanks be passed to Dr. Nansen for his paper, and that will be carried by acclamation."

The vote was carried by acclamation, after which his Royal Highness the PRINCE OF WALES said:—

"Mr. President, ladies and gentlemen, what has fallen from the lips of Sir Leopold M'Clintock and Sir George Nares in moving and seconding the vote of thanks to Dr. Nansen, leaves me very little to say but entirely to endorse all that has fallen from them. We are, I think, highly indebted to Dr. Nansen for having given us such an instructive and interesting narrative of his adventures on this arctic exploration, and my only regret was that it was not longer; but it must have been a severe tax upon him to describe, in a language which is not his own, so admirably, and in many instances so graphically, the incidents which occurred to him during these many months on the ice. These descriptions have also been greatly enhanced by the fine photographs we have seen to-night. For my own part, I must congratulate you, Dr. Nansen, on having returned to your native land, and on having paid us another visit. I had the advantage of seeing you on a previous occasion, and it is now my high privilege to have been asked by the Council of the Royal Geographical Society to give you, in the name of the Society, a special gold medal, which has been struck to commemorate your achievement. You have already in your possession the Patron's Medal, which was awarded to you five years ago; this is one specially struck for you, and I am sure it is one you will appreciate and value in the years to come. Allow me to present it to you."

Dr. NANSEN said: "I beg to thank you most sincerely, deeply, and warmly for the exceptional honour which has been bestowed on me and my expedition. It is so much dearer to me coming from this nation, and from this Society, which has counted among its members the most prominent, the most distinguished, and most enterprising explorers that the world has ever seen; and it is so much more honouring, as it comes from a foreign nation. It shows the spirit of that nation, which has always taken the lead in all kinds of exploration. I need not say that it is an additional honour to receive this medal from your Royal Highness's hands."

The Prince of Wales then presented a silver medal to Lieut. Scott-Hansen, who expressed his thanks to the Society for it.

The PRESIDENT said: "We have to thank his Royal Highness for having come to give the medal to Dr. Nansen; and also his Royal Highness the Duke of York, for honouring the Society with his presence."

Silver medals will be sent to Mr. Colin Archer, the builder of the *Fram*, Captain Sverdrup, Dr. Blessing, and Lieut. Johansen, and bronze medals to the rest of Dr. Nansen's comrades.

A representation of the special medal accompanies this notice, together with the portraits of Dr. Nansen, Mr. Colin Archer, Captain Sverdrup, and those who were specially concerned in the scientific observations on board the *Fram*. The presentation to Dr. Nansen, to which Sir Leopold McClintock referred, has taken the form of a specially bound set of British Arctic voyages, to which only those who have themselves spent at least one winter in the arctic regions have been allowed to contribute.

EXPLORATIONS IN MYSIA.*

By J. A. R. MUNRO and H. M. ANTHONY.

Our journey up the Rhyndacus brought us to Tavshanli, a considerable town about eight hours west of Kutaya, and the same distance north or north-west of Azani. Now, Sir Charles Wilson states that "Tavshanli was of importance during the early Turkish period as a station on the great road from Kutaya by Balat and Balikisiri to the Dardanelles and Gallipoli."† This statement at first puzzled me, for, owing to the error in Kiepert's map, whereby the Egriguz Dagħ and the Emed district are thrust too far to the south, I did not at once recognize this road to be the same as that which we followed from Tavshanli as far as Sulya on our way to Emed. It can scarcely be called a great road at the present day, but it is quite easy, at least as far as Sulya. We must have crossed it at Balat, but in the dark; and again we crossed it in the Macestus valley about 6 miles south of Kelsud. A castle on a steep spur above the left bank of the Macestus commanded the passage of the river. From Balukiser there is a direct continuation of this road westwards through Balia to the head of the Egepus, and thence over the watershed and down the Scamander to the Troad. The road, so far as I can see, presents no great difficulty. Its existence in ancient times would furnish a welcome explanation of several obscure points: (1) The order of Hierocles' enumeration—Ilium, Troas, Scamandrus, Polichna, Pemanenum—suggests a road. (2) An inscription of Novum Ilium‡ records that a garrison from Pemanenum was sent to defend the town in 80 a.c. This fact seems

* Continued from p. 165. Map, p. 248.

† Handbook to Asia Minor, p. 59.

‡ Published in Schliemann's 'Ilios,' p. 636.

to indicate some fairly direct communication between the two places. (3) Aristides drives from his paternal estate through Pœmanenum to the hot springs on the *Æsepos*. The road is in bad condition after rain, but it is a road practicable for wheeled traffic. (4) This road would explain the movements of the Turkish division under Mahumet in the year 1113.* As has been already mentioned in connection with Lontiana,† the Turks divided near Lopadium, and, while the one half took the outer circle round the coast to Adramyttium and thence up the *Caicus*, Mahumet's division kept inland by Lontiana to Pœmanenum. Alexina, on hearing the news, dispatched Camytzes from Niema in pursuit. He fell in with Mahumet at Aorata, fell upon him, and dispersed his force, but omitted to push on to Pœmanenum, where he would have been secure. The Turks rally in a plain beneath Aorata, defeat Camytzes, and take him prisoner. Both Turkish divisions are making homewards towards Dorylaeum, for the emperor, advancing through Malagena, cuts off their retreat in that region. It is natural to suppose that they wheeled round on parallel curves: the one through the Troad and Adramyttium, the other through Pœmanenum and Hadrianothera, i.e. on the road we have been discussing. Camytzes would march by Lopadium and the *Mæcæstus*. I venture to suggest that Aorata is the castle which guards the passage of the river on the Balat road. The situation admirably corresponds with the description. (5) Next to Pœmanenum Hierocles mentions Artemea. Mr. Ramsay‡ has very plausibly identified Artemea with the hot springs on the *Æsepos*, which were sacred to Artemis Thermæa.§ In his latest work, 'St. Paul the Traveller and the Roman Citizen,' he brings St. Paul to Artemea on his journey to Alexandria Troas after he had been prevented from entering Bithynia. "A tradition that Paul had travelled by the sacred town of the goddess Artemis at the hot springs of the river *Aisepos* can be traced as early as the second century, accompanied with the legend that he had founded a chapel in the neighbourhood."|| Mr. Ramsay, with whom I entirely agree as to the general course of this journey, takes St. Paul down the Rhyndacus, south of Lake Manias to Gonen, and round by the coast road to Alexandria Troas. The first part of this route is very difficult, the second part is very circuitous. If the road by Balat, Balukiser, Balia, and the Scamander be admitted, it offers an easier and a very much more direct route to St. Paul's destination; indeed, this road is almost a straight line from Cotyrium to Alexandria Troas, and it leads right past the hot springs on the *Æsepos* at Khydyrlar.

The force of these various considerations is cumulative. They all

* Anna Comnena, 'Alex.' XIV. 5. Compare Ramsay, 'Hist. Geogr.' p. 208.

† Above, p. 161.

‡ 'Hist. Geogr.' p. 151.

§ Aristides, ed. Dindorf, vol. i. p. 503.

|| P. 197. The authority is not quoted.

tend to confirm, firstly, the existence of the road from east to west; and, secondly, the position assigned to Poemanenum and the hot springs of Artemea. Against them may be set the vague statement of Nicetas,* that a division of Franks, marching from Pegæ to Lopadium, was encountered by Theodoro Lascaris, *περὶ τὸ λεγόμενον Πομαννόν*. I take this expression, which in any case cannot be pressed, to mean "at the junction of the road from Poemanenum with the coast road."

We now return to the Macestus valley. North of the Demir Kapu pass a road forks from the Balukiser *chamassée*, and keeps away to the east of it to Kepsud and Bigadich. This road, now comparatively little used, was once important as the main route from Lopadium to the upper Caicus and Hermus valleys. From Maje, on the hills east of Kepsud, we had a good view of it winding down the slopes of the Yılanlı Daglı; but it was at Kepsud that we first came upon it. The town lies on a tributary of the Macestus which flows parallel to the main river, separated only by a low rise. Several inscribed bases, some carved stones from a church at one of the mosques, and a field of shapeless rubble-and-concrete ruins on the south side of the town, indicate the neighbourhood of an ancient site, but its name cannot be determined. The road continues southwards through bare arid country, first up the Kepsud stream; then, after crossing the ridge to Kalburja, up the Macestus valley to Bigadich. It is easy, but uninteresting.

Bigadich, or Bogadich, lies at the foot of a hill overlooking a small plain, which opens from the right bank of the Macestus. It is a fairly busy place, with some show of a bazar. A good deal of cotton and opium is grown on the plain, but the chief industry appears to be tanning. Here the road divides. One branch continues southwards over rocky hills to Sinjerli, where it forks again to Simav and to Ak Hissar (Thyatira); the other bears away to the west of the Macestus, over bare uplands to the upper Caicus valley. This is an easy although now little frequented road. It leads in eight hours by Gyljuk and Chobanlar to Gelemba. There are also roads from Bigadich to Balukiser and Balat.

The acropolis of Bigadich has been crowned by a fortress of great extent and strength, the massive external walls of which are still standing. This fortress must have been the largest and most important in the whole Macestus valley. Now, the most important stronghold on the road from Lopadium to the Caicus and Hermus valleys was the fortress of Achyraous, or Ochyra, built, according to Nicetas,† by the emperor John Comnenus, and often mentioned in the Byzantine wars. Achyraous cannot have been very far from Hadrianothera, for the two are combined in one bishopric in the later Notitiæ.‡ Its situation may

* Nic. Chon., "Post captam urbem," §.

† Nic. Chon., p. 22 B.

‡ See Ramsay, "Hist. Geogr.," p. 156.

be more precisely determined from the terms of the treaty between Theodore Lascaris and the Franks.* The latter were to hold Achyraous; Calamus, the frontier village of the theme of Neocastra, was to remain unoccupied; Theodore was to have everything south of Calamus and east of Lopadium. It is clear that the frontiers were drawn practically along the valleys of the Macestus and the Caicus, and that Achyraous was the extreme south-eastern point of the Frankish territory. Calamus, or Calanta, was close to Stratonicea† (Silerik), and the road from the upper Caicus to the Macestus valley lay through Calamus and over hills to Achyraous.‡ This road corresponds to the road from Gelembö to Bigadich, and the great fortress at Bigadich to Achyraous. The roads from the north and the roads from the south are focussed at Bigadich, which would also be the meeting-point of the frontiers. I have little hesitation in identifying Achyraous with Bigadich, and (as the name alone might suggest) Calamus with Gelembö.

At Persi, a village about two hours to the north-west of Bigadich, on the other side of the Macestus, we discovered a very curious little rock-hewn church and hermit's cell. An isolated pinnacle of rock overlooking the valley has been entirely hollowed out. At the top is the hermit's cell, a simple square chamber with a stone bench along each side. Below is the church, which is very complete in all its details. It contains two rock-cut tombs, and the walls are decorated with rude carvings and remains of frescoes.§ The district of Ciminas, a mountain in the Frankish territory near Achyraous,|| was a noted haunt of hermits.¶ Possibly Ciminas may be the conical hill now known as Sivri Topo, which is a prominent landmark from the plain of Balukiser, and the cell at Persi may have harboured one of the hermits.

The lower Macestus flows from south to north. The upper Macestus (from its source to near Bigadich) flows at right angles to the lower course, from east to west. The lower Macestus valley is an important channel of communication between great centres of population, the plains of the Caicus and Herminus on the south, and the coasts of the Propontis and Constantinople on the north. The upper Macestus valley connects no great cities; at most it can only have been a little-frequented route between the Caicus valley at the one end, and Cotiaium and Dorylaeum at the other. But from Pergamus and the western districts the road by Balukiser, Balat, and Tavshaui would probably be preferred. Consequently, few indications are to be discovered of the

* Georg. Acropol., 15.

† See Ramsay, 'Hist. Geogr.' pp. 129, 133.

‡ See the march of Frederick, quoted by Ramsay, pp. 129, 130, and Georg. Acropol., 57: ταῖς τοῦ Καλαμου βουνοῖς παρμολύσαμεν καὶ τῇ Ἀχυραοῦ ἐγγὺς ὁ βασιλεὺς ἐπέβητο τῆς περσῆς.

§ Professor Anderson hopes shortly to publish an account of this interesting rock church, with plans and illustrations.

|| Georg. Acropol., 15.

¶ Theoph. Contin., VI. 27.

existence of the upper Macestus road in ancient times. Mr. Ramsay can say with justice that "there is no evidence that a road Kotiaion—Aizanoi—Synaos—Ankyra—Makastos valley—Stratonikaea—Pergamos, was in use."* Yet of the three roads from east to west between Olympus and Temnus, the Rhyndacus road, the Balat road, and the Macestus road, this last is, I am sure, far the easiest. The only considerable difficulty is the pass over the Shabhan Daglı at the head of the valley, and this cannot be very serious, for it is proposed to extend the carriage road from Gediz over it to Simav. We may assume, without positive proof, that the road did exist in antiquity, and the assumption is in some cases convenient. The inhabitants of Mysia Abbatias and Phrygia Epictetus combine to honour C. Salvius Naso with a common monument.† The term Abbatias seems sometimes to include not only Ancyra and Synaos in the Macestus valley, but also Cadi (Gediz) to the east of the watershed.‡ Cadi and Azani on the one side are grouped together with Ancyra and Synaos on the other in one ecclesiastical district.§ These facts seem to point to some easy intercommunication. Again, Mr. Ramsay has himself very plausibly suggested that this was the road whereby the one division of the Turkish invaders in the year 1113 retired homewards, after marching round the coast of Troad and up the Caicus valley through Germe and Chliara.|| I have sometimes thought that Attalus I. may have marched back by this road after his incursion into the territory of Achæus in the year 218 B.C.¶ Attalus, who had been threatening the cities of Æolis, advanced across the Lyons against "the colonies of the Mysians," which I take to mean Seleucid military colonies of Mysian mercenaries north of the Hermus. Then he came to a place or people Carseis, and next to Didyma Teiche, which were surrendered to him by the officer left in command by Achæus. Thence he proceeded to ravage the plain of Apia, crossed over Mount Pelecas, and encamped by the river Megistus. Here his Gallic troops mutinied, and he had to lead them back to the Hellespont, whence he went home to Pergamum by the coast road through the Troad. If Apia were the place of that name south of Cotiaium, and the Megistus the Macestus, one might say that Mount Pelecas is the Shabhan Daglı, and Attalus marched out eastwards on the south of Mounts Temnus and Dindymus, and back westwards on the north of them. But I am now inclined to believe that Attalus' campaign was of shorter range, and did not extend nearly so far to the east. He must, I think, have crossed the Lyons south of Thyatira,

* 'Hist. Geogr.' p. 168, note.

† C.I.L., xiv. 2218.

‡ See an inscription in Le Bas and Waddington, No. 1001, and Strabo, 570.

§ See Ramsay, 'Hist. Geogr.' p. 146.

|| See above, p. 257, Anna Comnena, 'Alex.' XIV. 5; and Ramsay, 'Hist. Geogr.' p. 209.

¶ Polybius, V. 77. Mr. Ramsay informs me that M. Imhof Blumer has a coin of Apia belonging to the time of the Seleucid kings.

and operated against the Seleucid colonies in that neighbourhood; then turned northwards or north-westwards to Carseis and Didyma Teicha, and struck the Macestus possibly near Sinjerli, with the intention of marching up it (*προελθεῖν εἰς τὸ πρόσθεν* = away from the Hellespont, c. 75). Carseis may be the Ceraseis of the Byzantines, which Mr. Ramsay takes as identical with Nacrasa.* The name is all over the district (Nacrasa, Acrasus, Gordus), and the ethnic form is significant. On this hypothesis Attalus intended to march eastwards up the Macestus, but was forced by his Gallic auxiliaries to march northwards down it.



EXED.

But where every point is so doubtful, it is perhaps vain to attempt a construction.

Of the upper Macestus between Bigadicli and Assar Keui, west of Simav, we cannot speak from our own observation. We had a good view down its long straight valley from the latter point, and could plainly trace the line of its cleft from the vantage ground of the hills above Sinjerli on our way to Gelembe, but we had no time to explore it further. We did, however, visit the plain of Simav by the difficult mountain track from Ascarlar, near Emud.

The situation of Simav is aptly compared by the Turks to that of Brusa. The town lies facing the north at the foot of the mountains,

* 'Hist. Geogr.' pp. 123, 124. On the name Gordus compare Ramsay in 'The Cilias and Bishoprics of Phrygia,' vol. I., 'The Lycos Valley,' p. 249. I have had no opportunity of consulting M. Rabat's recent discussion of Attalus' march in the 'Revue des universités du Midi.'

with the plain in front and the lake to the west. The abrupt wooded sides and bold outlines of the Temnus range form a fine background, but the lake at the end of the dry season is little better than a reedy marsh. The plain is well cultivated and dotted with trees, mostly walnuts. The northern hills are barer and less picturesque than the southern.

We rode round the north shore of the lake to Saŭjilar, and from there made an excursion westwards as far as Assar Keni in the vain hope of hearing of ancient remains farther down the valley. There are a few inscriptions at Saŭjilar and Baddelu and Assar Keni. Near this last village are two ruins, the one a large oblong enclosure in the plain, about 80 yards long by 50 broad; the other a castle, of which but slight traces remain, just outside the village. The village stands at the mouth of a wooded glen in the southern hills, and the castle must have defended the entrance and the hill-road over to Demirji.

Another road leaves the plain of Simav on the north side of the lake. It leads over a low easy *col* to the head of the westerly branch of the Egriguz Chai, which it follows down to Sinkler, and there strikes over the hills to Balat. But this road belongs to the Rhyndacus basin and the next section of our paper.

III.—THE HILL COUNTRY BETWEEN THE RHYNDACUS AND THE MACESTUS.

(By H. M. Anthony.)

1. *The Middle Rhyndacus.*

That part of the Rhyndacus which lies between Tavahanli and Kirmasti is to be distinguished on the one hand from the headwaters, and on the other from the lower reaches in the alluvial plains which lie to the south of the Sea of Marmara. The distance between these two points is about 65 miles as the crow flies. The general direction of the river valley is north-west. Shortly after passing Tavahanli the stream plunges into the midst of a hill country, from which it does not again emerge till Kirmasti is reached. On its northern bank lies the Olympus range. Its outlying spurs rise abruptly from the river valley, and are broken only by mountain glens, through which tributary streams hurry to join the main river. Behind this fringe of hills is to be seen the lofty ridge forming the actual Mount Olympus. This chain serves as a conspicuous landmark in all views from the south. Its gleaming crest of snow-white limestone towering above the sombre pine-covered shoulders can be clearly seen on the northern horizon from almost any elevated spot in the Rhyndacus basin.

On the southern bank of the river rises a confused mass of hills drained principally by the Egriguz Chai. Immediately to the south of the Rhyndacus their elevation appears to be less than that of the Olympus spurs, but the country ascends gradually to the south and

west, where the Bodaghan Dagħ, Shabbane Dagħ, Egriguz Dagħ, and Sinjan Dagħ rise to a considerable elevation above the high land forming the southern watershed. Like the southern slopes of Olympus, this country to the south of the river is for the most part forest covered. The hills are long continuous ridges, and their almost monotonous contours are only diversified by the more imposing outlines of the mountain masses mentioned above. Through this hill country the river has cut for itself a narrow and difficult path. Flowing now through a rugged defile, now through a valley, whose breadth rarely exceeds a mile and a half, only to plunge again into a gorge, it has deposited but little alluvial soil, and affords scant space for cultivation. Even below Kestelek, where the river has received the waters of its main tributary, the Egriguz Chai, and where it has turned northward to force its way through low hills into the plains, the breadth of the valley is hardly greater. The river itself has, however, greatly increased in size during its passage through the hill country. At Tayshanlı the stream was in September about 20 yards across, the current slow, and the water hardly covered our horses' knees. At Kirmasti, where the river has driven its last gap through the hills, there is a bridge a hundred and forty paces from bank to bank, and though in August the stream did not cover the whole of its bed, it must have been 60 yards wide, strong and rapid. Throughout this part of its course the water is turbid, and of a greenish white hue, which reminds one strongly of the streams of the China-clay districts in Cornwall. In spite of the narrowness of the valley, the strips of alluvial soil along the river-banks are carefully tilled, and seem to bear good crops of cotton and maize. The lower slopes of the enclosing hills are dotted with clumps of trees, outposts of large forests covering the hill country, and present a park-like appearance. In the gorges the vegetation is wilder; the river is hidden in plane trees, amongst which the wild vine and the cornel tree grow in profusion. The steep parts are for the most part covered with scrub oak. Fortunately for the traveller, the lateral valleys often afford an easier route than the course of the main river. The ascents are gradual, and lie through more open country, much of which is under cultivation and supports numerous villages. At higher levels the track winds for hours through forests, principally of pine. Towards the more elevated ridges again the forest thins, and open ground occurs more frequently, scattered with rhododendron bushes and black juniper. Throughout this upland springs are plentiful and of excellent quality.

The roughness of the country renders it highly improbable that the Rhyndacus valley ever served as an important means of communication between north-west and central Asia Minor. From north to south the roads from Brusa and Isnik round the eastern shoulder of Olympus, and from Mikhalieh and Cyzicus up the broader and less rugged valley of the lower Macesius, must have been preferred. From east to west the

road through Tavshanli, Balat, and Balukiser, and the road down the upper Maccetus, are both of them incomparably easier thoroughfares. Still, the numerous castles, whose ruins mark the course of the middle Rhyndacus, point, if not to the existence of an important road, at least to the possibility of its proving a source of danger to the shores of the Marmara—a tempting pathway to the Seljuk invader.

2. *The Country between Brusa and Beyjik.*

The Olympus range forms the barrier which shuts off the valley of the middle Rhyndacus from the Marmara littoral. Close under its northern slope lies Brusa, the administrative and commercial centre of the vilayet of Rhodavendikiar, and the starting-point of two roads by which the middle Rhyndacus may be reached. Of these one climbs the steep sides of the mountain immediately behind Brusa, and, taking a southerly course, crosses a little west of the highest point of the range. This route is more direct, but it is said to present great difficulties, and for pack-horses the other road is preferable.

From the summit of Mount Olympus, above Brusa, the height of the range gradually decreases towards the north-west, while the surface becomes less rugged. The easier of the two roads to Beyjik, passing through Chekirge, skirts the foot of the hills as far as Missi Keui. There it climbs to the top of the ridge, and, crossing an upland plateau for some three and a half miles to the south, reaches the watershed at a pass known as Akhlut Gedi. The character of the abrupt northern slopes of this ridge is similar throughout. A fringe of cultivation stretches up the mountain-side, but vine and mulberry soon give place to scrub oak and thorn, chestnut and walnut to beech and pine. The top of the range is drained chiefly to the southward. It is a rolling country covered with loose forests of oak and fir, enclosing patches of grass land. The soil is thin, and apt to leave the ridges bare. Immediately to the south of Akhlut Gedi the range is intersected by a deep gorge, known as the Kamchi Dukkan Deressi. It runs south-east, and discloses a fine prospect of the southern slopes of Olympus.

Crossing this gorge, the Beyjik road takes advantage of a narrow rocky defile which pierces its precipitous southern side, and penetrates to the southern slope of the mountains. The western side of the defile is formed by a towering limestone crag, rising perpendicularly from the bottom of the gorge, and from this rock the place probably takes its name, Kapulu Kaya (cliff-gate).

From the Kapulu Kaya pass the mountain ridge extends about three hours to the south before the edge of the Rhyndacus valley is reached. This upland bears the same character as that to the north of the Kapulu Kaya pass. The same park-like vegetation prevails, though the country is more rugged, the ridges higher, and the valleys deeper and more abrupt. As the Rhyndacus valley is approached, villages are found with a few

surrounding acres of tilled soil; but a ragged forest of pine covers all the hilltops. There is a brisk local trade in timber. Heavily laden timber trains are frequently encountered, and numerous saw-mills are driven by the rapid streams, which even in late summer contain a considerable volume of water. There seem to be hardly any traces of antiquity in this district. At Narlinar (one hour and a quarter south of Kapulu Kaya) we copied a solitary inscription, much mutilated.

The southern side of the ridge rises about 500 feet above the Rhyndacus bed, at the log-built village of Yurgek, where the Beyjik road strikes into the river valley. The descent from the pine-crowned ridge to the river is very steep. The underlying rock, judging from the cutting made by the stream, is a loose, crumbling, grey shale. Just below Yurgek the river disappears into a ravine, but for a few miles above the village the valley is of considerable breadth, though perhaps never more than a mile and a half. The alluvial soil is cultivated, and bears the usual crops of corn, maize, and cotton, supporting a considerable population. About 3 miles above Yurgek the valley narrows, but a broad, shallow lateral valley strikes off slightly to the southward, continuing the cultivated land, and separated from the bed of the main stream by a low range of hills. In this valley stands Beyjik. South and south-west of this lies the forest-covered hill country, which stretches right across to the Egriguz Dag and the valley of the Egriguz Chai.

The only towns of any importance in this part of the Rhyndacus are Beyjik, Harmanjik, and Tarshanli. Of these the first and the last possess many remains of antiquity. Tarshanli alone is of considerable size.

1. *Beyjik*.—Beyjik, the seat of a kaimakan, is distant about ten hours from Brusa. The road has been described above. The town is small, and apparently of recent growth. It lies slightly to the south of the Rhyndacus, and separated from it by a low hill. The population is mainly agricultural. With the exception of a pottery, where large coarse jars are made, there seem to be no manufactures. The modern town presents no further characteristics worth notice.

About a mile west of the modern town, and a little to the south of the road, lies the site of Hadriani. The ruins stand on a gentle hill slope overlooking to the south a small fertile plain. Loose stones and *débris* extend for some distance, amongst which rise massive walls of considerable height, composed of large squared blocks. In the modern town of Beyjik, and in the cemetery adjoining the road, are numerous inscriptions.* The ruins have always served as a quarry, and the remains still left are being carted away as material for the new prison in construction at Beyjik. If the stonemason's depredations are allowed to continue, the remains will soon disappear, and the site, which at present promises to repay excavation, will become entirely barren.

* See Le Bas and Waddington, "Inscriptions," vol. III. 1053-1066.

The size of the remains attest the considerable importance of Hadriani at some period. But the name does not occur in Byzantine documents, and in all probability the town fell early into decay. Secluded amongst hills and surrounded with thick forests, it lay unnoticed, away from the main current of history.

About a mile and a half west from the site of Hadriani are the remains of a castle situated on a small hill overlooking the Rhyndacus. It appears to be of late construction, and was doubtless built as usual to guard the bridge, whose ruined piers cross the Rhyndacus bed immediately below the castle and a few hundred yards above the modern bridge.

2. *Harmanjik*.—The distance from Beyjik to Harmanjik is about seven hours. For the first three hours the road ascends a valley drained by one of the small southern tributaries of the Rhyndacus. Near the villages the soil is cultivated; elsewhere it is covered with thickets of rhododendron and juniper, and at higher levels with a coarse grass. From an hour above Beyjik the underlying rock is grey granite. At a distance of three hours from Beyjik the road reaches a high ridge, known as the Yenicheri Gedi, and from that descends into a thick pine forest, from which it does not again emerge till within a mile of Harmanjik. Beyond occasional glimpses of Olympus to the north and Meran Dag to the south, there is little to be seen. Here, as elsewhere, the forests have suffered considerably from extensive fires. Not only is the underwood destroyed, but enormous damage is done to the timber by these outbreaks. In late summer forest fires are visible on the hills in every direction, and no attempt is made to check them.

It seems probable that Kiepert's map places Harmanjik some distance to the north and east of its true position, and that it really lies about due north of Egriguz, and at a much shorter distance away than has been hitherto supposed.

In support of this view, it may be noticed—

1. That Perrot (*La Galatie, Route-Map*) makes the road from Beyjik to Harmanjik take an almost southerly direction, tending but slightly to the east of south. This is quite wrong according to Kiepert's map, which makes the road take an almost easterly direction, tending but slightly to the south of east. The accuracy of Perrot's survey in regard to the details of the route is confirmed by our own observations, according to which the topographical details shown by Kiepert's map are not correct. The accuracy of Perrot's details affords strong presumption for the correctness of his general direction,

2. Moreover, the authorities at Tavahanli, when told that we had come to their town on our way from Harmanjik to Emed, showed considerable incredulity, and told us that we had come by the "longer way." On the information supplied by Kiepert's map, this seemed inexplicable, as Tavshanli lies but little to the east of a straight line drawn from Harmanjik to Emed. But if Perrot's position for Harmanjik

be adopted, and it be remembered that Emed has to be placed much further north than has hitherto been done, it becomes obvious that our route Harmanjik—Tavshanli—Emed lay along two sides of a triangle whose apex is Tavshanli.

3. The neighbourhood of Harmanjik seems to be wrongly delineated on Kiepert's map. As neither the Rhyndacus nor its valley are visible from the town or the high land in the neighbourhood, it is improbable that they can lie so close to Harmanjik as shown on the map. Secondly, the stream on the north bank of which Harmanjik is situated does not flow into the Rhyndacus a little to the west of the



VALLEY OF ENJAN CHAI.

town. Against this Perrot's survey, confirmed by our observations, is conclusive. This stream flows south away from the Rhyndacus, and is most probably the Harmanjik Su; of which we heard when inquiring the course of the Bolaghan Dere stream. It is a tributary of the Egriguz Chai, and joins the Rhyndacus at Kestelek. On the whole, it would appear that the cartographer has transferred to this Harmanjik the details which belong to another Harmanjik lying to the south-east where the same details recur. But, whatever be the explanation, it is certain that neither the position nor the topography of Harmanjik are satisfactory as shown on Kiepert's map.

The town of Harmanjik calls for no special notice; it is small and unimportant, the seat of a *mudir*. A large loggiaed building, formerly a barracks, is the most prominent feature of the town. In the neighbourhood is a chrome iron mine.

3. *Tavshanli, Moinal, and the Plain.*—Tavshanli lies about six hours

south-east from Harmanjik, two from Delikli Tash. It is on the section of the Rhyndacus above that hitherto described under the name of the middle Rhyndacus. The town is built on the slopes of low arid hills, which form the eastern limit of an alluvial plain about 4 miles in breadth. The surrounding hills present monotonous similarity. They are treeless, barren, wind-swept masses of dun-coloured rock, for the most part bare, or at best covered with but a thin soil, which supports little vegetation. Their rugged outlines, and the almost complete absence of verdure, bring to mind the Mokattam hills near Cairo. The underlying rock appears to be a light tufa, like that of the famous Delikli Tash. The plain on the edge of which Tavshanli stands is more fertile, and supports several villages. These are surrounded with clumps of trees, and stand out like islands above the dreary level of the plain, which in winter is a swamp.

This barren country which surrounds Tavshanli is entered upon by the Harmanjik Tavshanli road, about two and a half hours to the north-west of Tavshanli. It is the commencement of an entirely new district, geographical and geological, and of a quite distinct civilization. Hitherto the road has traversed a country looking west; it now enters on a region looking south and east. Hitherto the country has been drained by the middle Rhyndacus, the hills have been covered with thick forest; the country on which the road enters at this point is treeless and barren—the district belongs to the valley of the upper Rhyndacus. What traces of ancient civilization there are in the valley of the middle Rhyndacus bear the mark of an Hellenic origin. The upper Rhyndacus district is naturally connected with the Phrygian region to the east, the impress of whose civilization is plainly marked in the antiquities of Tavshanli and the neighbourhood. As compared with the forest-covered hill country west of Tavshanli, the district to the east offers easy and obvious communication. On the frontier of this sphere of Phrygian influence stands the Delikli Tash as a sentry. A rugged and striking mass of yellow tufa rock juts out into a narrow valley. Part of the south-eastern face of this has been artificially shaped to represent a façade surmounted by a pointed gable. At some little height above the sloping ground, and approached by steps, a false doorway is carved, having double doorposts and a moulded lintel.* The neighbouring rocks bear many traces of artificial shaping; one rock is certainly gabled, but there is no trace of a tomb. The tufa is easily cut into chambers. Everywhere it assumes the most fantastic outline in weathering, and the effect is heightened by the colour of the rock, which ranges from gray to a rich golden hue.

Tavshanli itself is a large compactly built town. Though a

* For plans, sketches, and description of Delikli Tash, see Perrot, 'La Galatie,' pp. 104-107; Perrot and Chipiez, 'Art in Phrygia,' pp. 86-91 (English translation).

considerable proportion of the population is Armenian, the town boasts six or seven mosques. The Armenians appear to occupy the greater part of the large bazars, and seem prosperous and contented. Their church is surrounded by a graveyard containing some ancient Armenian tombs. The town faces south-east. Half a mile to the west on the Delikli Tash road lies Moimul looking south-west, from the further slope of the arid hills which here project into the plain. Both of these towns contain inscriptions, but Tavshanli is said to be a Seljuk foundation, and Moimul is reputed to be the old town. In both inscriptions often occur, and most frequently on one type of tombstone—a Naisous with round arch, panelled door below, and pointed gable above. This form of tombstone with its well-marked door is so universal in these towns that it can hardly fail to suggest a connection with the characteristic door tombs of Phrygia, of which the Delikli Tash is the westernmost example. The numerous tombstones and inscriptions at Tavshanli and Moimul evidently originate from a large site. Beyond their existence, neither town appears to possess any claim to an early foundation, and it is possible that the stones were brought here from Azani.

3. *The Southern Tributaries of the Rhyndacus.*

From Tavshanli several important roads radiate. One leads eastwards to Kutaya, another south-east to Azani, while a third makes for Balat, taking, to begin with, a south-westerly direction. After crossing the Rhyndacus and its plain, and surmounting a low col between Dere Keni and Gynljuk, this road leaves the main river behind and enters on the basin of its southern tributaries. The valley which it enters after Dere Keni descends from the Bodaghan Dagħ on the east in a westerly direction. The Balat road follows it by the side of a small stream, pointed out to us as the Harmanjik Su, which is said to join the Rhyndacus below Harmanjik. The route taken by us, however, clearly proves that this stream cannot join the Rhyndacus between Yurgek and Tavshanli. Still, the name Harmanjik Su may be in a sense correct, as it is extremely probable that the stream from Bodaghan Dagħ is a branch of the stream which comes down the Uzun Dere and past Harmanjik. In this case the main stream would come from Harmanjik to a point somewhere north of the Egriguz Dagħ, where the Bodaghan Dagħ branch would join it. The Balat road appears to follow the Bodaghan Dagħ stream round the north shoulder of the Egriguz Dagħ past its junction with the Harmanjik Su, and later with the Egriguz Chai, and so westwards to Balat. It has been fully dealt with in Part II. of this paper.

At about two hours' distance from Dere Keni a road diverges in a southerly direction from the Tavshanli-Balat road, and leads to Emed. It passes through the village of Sulya to the south of the Bodaghan Dere, and strikes up a deep rocky valley, running from east to west,

and converging on the Belaghan Dere a little to the west of Sulya. Down this gorge, which is known as the Jeviz Dere, comes a stream from Küprajik. After ascending the Jeviz Dere for a couple of miles, the Emed road climbs its southern side on to a lofty ridge, crosses the Esi Bey Dere, a bare rocky valley lying east and west, which falls away rapidly in the direction of Egriguz, and climbs a steep hill beyond, on the south-western side of which lies Emed.

The town is situated in a notch in the hills, surrounded on the north and east by low crumbling cliffs and steep earth slopes. A new barracks in process of construction to the south of the town, points to its being a military centre for the district. The town is compact and populous; on market days it is thronged by peasants from the surrounding district. At the lower end of the town is a group of hot springs. One of them pours a copious stream of water directly into a bath, and its temperature is so great that a plunge is most painful. One of the springs smells of sulphur. In the Turkish cemetery to the east of the town are numerous ancient stones, some columns of dark blue marble quite 2 feet in diameter, and a few naisci, such as we found at Tavshanli. But most of the remains consist of square bases. These are very numerous, but the limestone is so soft that they are much weathered, and the inscriptions very illegible. One votive inscription refers to a cure, doubtless effected at the hot springs. On the west of the town is a recently opened rock-cut grave. An ancient pottery jug which we bought in the town was alleged to have been found in this grave, but is perhaps of far greater antiquity, and indicates a very early settlement on this site. The remains and the hot springs point to the existence of a Greek site at or near Emed, with a church.

Some 8 or 10 miles to the west of Emed lies the Egriguz Dagh, a lofty range of forest-clad mountains running north and south. Its rugged outline forms a landmark for many miles round. The highest point of the ridge lies about due west of Emed, across the valley of the Egriguz Chai. The road from Emed to Simav crosses the southern spur of this range over a high pass about 20 miles south-west of Emed, and from there descends into the wide plain of Simav.

A consideration of the distances on this Tavshanli—Emed—Simav road brings out the fact that Emed and its neighbourhood, with the entire range of the Egriguz Dagh, has been placed much too far to the south on Kiepert's map. The distance from Tavshanli to Emed, on our reckoning, must be considerably less than the distance from Emed to Simav, yet Kiepert makes the former distance nearly double the latter. Emed must therefore be moved to the north, as shown in the accompanying map. This is confirmed by plane-table and compass observations taken from three points on the western side of the Egriguz Dagh, from points near Hamza Bey, Sinekler, and Araklar. These observations fix the peak of the Egriguz Dagh, which bears due west

from Emed, and confirm the position of the latter town as determined by the distances on the roads. With the position of Emed, the range of the Egriguz Daglı and the town of Egriguz must also move to the north. The longitudinal position of the district requires no alteration.

The Egriguz Chai, which flows between Emed and the Egriguz Daglı, is a strong, rapid stream. It rises on the northern slopes of the Shabhaue Daglı near Gediz, and, flowing in a north-westerly direction, passes by a narrow gap through an intervening ridge of hills into a small alluvial plain, where it is swollen by several brooks descending from the southern spurs of the Egriguz Daglı. On one of these, about



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3 miles from the left bank of the river, stands Assarlar, a small village, but important on account of its ruins and inscriptions. A quarter of a mile below the village a large marble block bearing a long inscription is built into a rude bridge. In it mention is made of the *εαριγγυς* of Apollo in the grove.* The inscribed block is so massive that it cannot have been brought from any distance. Most probably it came from the neighbouring hillside, where the villagers have excavated a remarkable piece of building. Two massive bits of wall have been uncovered parallel to one another. They are constructed of immense blocks of the local limestone, and do not appear to extend far into the hillside. They most resemble the piers of a triumphal arch, with a projecting

* For the description, see Le Bas and Waddington, 1011; and C.I.G., 3347b.

cave course where the arch would spring. Around these ruins lie several small bases and capitals, and a litter of loose stones. Assarlar is probably the *proconance* of the inscribed marble block at Egriguz relating to the *εὐβοῖαν διοί.** There is also at Egriguz a large moulded marble block, now forming the lintel of the doorway leading to the rock castle which overhangs the town. This probably came from the same source as the inscription, a source which is not to be looked for at Emed, where the remains, except in the columns from the church, are all of soft limestone, and show poor workmanship. In all probability, then, Assarlar must be considered as the site of the grove of Apollo, and also of the cult of the *εὐβοῖαν διοί*, in which case Tiberiopolis can with considerable probability be placed at Assarlar.

To return to the Egriguz Chai. Shortly after passing Assarlar, this stream enters the long straight valley lying between Emed and the Egriguz Dagħ. From the right bank of the river the treeless, cultivated slopes rise gradually to the east, culminating in a bare ridge perhaps 1000 feet above. The town of Emed can be seen from the river in a hollow below the ridge, about 600 feet above the river-bed. The western bank is formed by the foot-hills of the Egriguz Dagħ. As the river flows north the valley becomes narrower and deeper, its sides more precipitous. At Egriguz a limestone crag, 500 feet in height and crowned with a ruined castle, blocks the valley. Under the eastern end of this crag, and beneath tremendous precipices on the opposite side, the Egriguz Chai has cut a narrow gateway only a few yards broad, known as Demir Kapu. This projecting crag is not more than 200 yards in thickness, and is connected with the hills on the west by a saddle-shaped isthmus, astride of which is the village of Egriguz. The castle is Byzantine, but little is left of it save a strong gateway on the western side, protecting a steep stairway now in ruins. This is the only means of access to the crag, and leads to a shelf which runs right round the rock. Above the shelf (which is about 100 feet higher than the town) rises another crag, a citadel within a citadel, whose western end bears traces of building. A mile or two north of Egriguz the river passes through a second ravine, only inferior to the Demir Kapu in grandeur. Through this wooded hills are visible in the distance, but the course of the river below is concealed from view. It is, however, now certain that it joins the Rhyndacus above Kirmasti, near Kestelek. Flowing north through the second ravine, it is probably joined by the Bodaghan stream, which we last saw skirting the mountain spurs of the Egriguz hills. Below this point it must turn to the west to reach Gune; for four hours south of Gune it is joined by another tributary (to be described below), and is found at Gune flowing in a north-westerly direction. The road from Kutaya *via* Tavshanli Balat and

* Le Bas and Waddington, 1921; and Ramsay, 'Hist. Geogr.', p. 147.

Balukiser to the Dardanelles probably followed the course of the Bodaghan stream to its junction with the Egriguz Chai, and then struck westwards up one of the tributaries which join the Egriguz Chai from the neighbourhood of Balat.

One other stream remains to be noticed, which drains the western slopes of the Egriguz Dag and joins the Egriguz Chai four hours above Gune. It takes its rise in a depression in the hills immediately north of Lake Simav, and only a mile or two distant from it, at a small hamlet known as Hamza Bey. Only a slight rise divides the watershed from the basin of the lake. From Hamza Bey the stream flows due north to a point below Sinekler. At first the valley is featureless and uninteresting, with scrub-covered slopes of whitish earth. As it dives into the heart of the hill country it becomes deep and rugged, and its sides often rocky. Below Sinekler the stream passes through a fine gorge between castle-like rocks. The surrounding hills are either bare or else covered with thick forest. Villages are numerous, commonly built of large pine logs, but they are poor and mean. At Sinekler the road leaves the river valley and turns north-west to Balat. Somewhere in the maze of rugged hills north of Sinekler, the stream joins the Egriguz Chai at a point which can only be conjecturally fixed by its reputed distance from Gune. Only one feature of its valley demands special attention. In the valley between Sinekler and Tash Keui, and immediately beneath the latter, are the remains of an important temple site. In a field on the right bank of the stream are traces of building and many large squared stones. There are only two inscriptions visible. One records a dedication to Zeus Pandemos, who is probably the Zeus of Abretteus, a Mysian god mentioned by Strabo in his story of the robber priest Cleon.* Cleon's stronghold Callydium is not known, but might be found anywhere in the neighbourhood of Tash Keui. This rough track of country would afford a most secure home for a strong robber band.

Between Tash Keui and Balat the Dikeli Tash forms a prominent landmark. It is a natural pinnacle of tufa rock about 30 feet in height, standing on a hillock of the same stone to the south of the road. There are numerous traces of cuttings in the surrounding rocks. In one place steps are cut; in another there are marks possibly indicating a rock tomb, but some natives armed with picks and wedges, while engaged in quarrying hard by, produced exactly similar marks, so that it would be rash to assume that any of them are ancient. Still, the rock is such as Phrygian tomb-cutters loved, and the stone, from its singular shape and prominent position, must always have been venerated.

From the rugged hills round Balat several streams descend through rocky glens eastwards to the Egriguz Chai. The streams themselves are of little size or interest, but the town of Balat must detain us for a few moments. The town is large. It is said to contain six thousand

* Strabo, § 574.

houses, and is well watered and clean. With the exception of a small colony of Greeks (twenty houses in all, and a church dedicated to Hag. Demetrios), the population is Mohammedan. Overhanging the town is a singular hill of naked grey granite with jagged upright strata; its slopes are strewn with massive rugged boulders. To the east of Balat, between the town and the Egriguz Chai, there is much tufa rock.

There must have been a city at or near Balat in antiquity, but no identification is possible at present. From an inscription referring to "the Senate and People of the Hadrianeans," which we found at Balat, it will appear that this town, if not actually in the territory of Hadriani, was in close connection with it. It is hardly probable that the inscription has been brought to Balat from Hadriani, a distance of some 30 miles over rough country, as there are numerous other remains round Balat itself.*

Above Gune, then, the Egriguz Chai has received the waters of the Bodaghan Dere and the Harinanjik Su on the east, and on the west the streams from Hamza Bey and those from near Balat. At a point near Gune it plunges into a succession of ravines and narrow deep valleys, keeping a little to the west of north till, after passing the ridge of the Sinjan Dagb on its left bank, it takes a sudden bend to the west near the Kasik Bel, and then flows in a north-westerly direction to join the Rhyndacus a couple of miles below Kestelek. From Gune to the Rhyndacus valley the country on both sides consists of rugged hills entirely covered with thick forests of oak and pine. The roads are difficult for travelling on horseback, and impassable for wheeled vehicles. The only feature of interest between Gune and Kestelek is a group of colonies of Rumelian refugees, who are engaged in reducing to cultivation part of the forest south of Kestelek. From Kestelek a road leads in a south-westerly direction across the Egriguz Chai, and then over a high range of wooded hills to the Macestus valley at Kelsud. The basin of the latter river is entered at Delanderos Bel, nearly four hours north-east of Kelsud. There are no antiquities on the route; in fact, nothing interesting beyond the extraordinary medley of races that inhabit this ridge—Circassians, Turkimans, Yuraks, and Rumlans, in addition to numerous Osmanli villages.

The main valley of the middle Rhyndacus and the basin of its southern tributaries, that is to say, the country from Olympus on the north to the Egriguz Dagb on the south, and from Delikli Tash on the east to the Macestus watershed on the west, possesses few sites, and plays a very unimportant part in history. In the Mithridatic wars this region was held with Abhatis and Phrygia Epirotus for the Romans by C. Salvius Naso.† The Byzantine wars raged round the hill district. It

* See Le Bas and Waddington, vol. iii. pp. 1044-1052.

† C.I.L., xiv. 2218.

is a country too broken alike for military operations, commerce, and agriculture. Rapid and easy communication can never have been possible across it, but both the road through Balat and the road up the Macostus seem to have been occasionally traversed, even by armies, as has been shown in the preceding section of this paper.

TABLE OF ALTITUDES. BRUSA TO KIRKAGACH.

Place.	Feet above sea.	Number of readings.
Narlınar (camp below)	1467	2
Boyfo	1468	4
Yenteheri Gedi	2052	1
Harmanjik (camp below)	2019	2
Spring near Yeni Keul	2017	1
Tavshanlı	2662	2
Emirler Keul	2748	3
Jeviz dere	2963	1
Emed	2506	1
Yenijik (camp above)	3223	2
Simav	2733	2
Sağjilar	2502	4
Azmar Keul	2281	1
Sinekler	1949	2
Balat	1247	2
Güne	1405	2
Ashar Ballk Keul	1757	2
Sej Keul	2636	1
Bigadich	416	3
Cholanlar	1200	2
Kirkagach	484	1

Postscript.

Since these pages were printed, I have paid a flying visit to Balia, and passed within a few hours' ride of Khydyrlar. It was too hasty an excursion to solve all the problems raised in the second part of this paper, but certain facts may be noted which seem to bear upon them.

There was an ancient town at or near Balia Maden. Its name, as given in an inscription recently found there,* was Pericharaxis. The name seems to connote a settlement which had grown up round an entrenched camp.† The conjunction of the names Balia and Pericharaxis shows the prophetic insight of Mr. Ramsay's remark: ‡ "Three of the places named Palia appear to have been fortresses, and hence the set of names in *Teichos* and *Charax* suggest themselves for comparison." The *charax* at Balia was probably succeeded by the castle, the ruins of which crown the nose of rock at the junction of the two

* Published in the *Harmonia* of Smyrna, February 22, 1895, quoted in the *Bull. de Corr. hell.*, xviii. p. 341, and *Mith. aus Athen.*, xi. p. 236, and more correctly from a squeeze by Kalinka in *Mith. aus Oesterr.*, xviii. p. 223 (but the space before δ *lagna* is really blank).

† Compare Arrian's description of Phaula, 'Periplus,' 9, and the Roman cretars.

‡ 'Hist. Geogr.' p. 163.

valleys an hour to the north of the town. This position must have had a certain importance (there are remnants of two Roman bridges in the eastern valley), but scarcely enough for *Pœmanenum*. Moreover, the last section of the direct road from Balukiser to Balia is too rough for wheels. The carriage-road runs farther south, and turns northwards after rounding the castle of Gumenij, or Dömenidj, as Kiepert has it. This castle was described to us as much stronger and more imposing than that at Balia. It lies half a dozen miles to the south of the town. These facts about the ancient name, the roads, and the castles, seem to show that *Pœmanenum* is to be sought, if my argument is correct, not precisely at Balia, but perhaps at Gumenij.

The conjecture that *Artemea* may have been at Khydyrlar is to some extent confirmed by what was told us in the neighbourhood of ancient remains there. We were too hard pressed for time to visit the site, but I hope to return some day and settle the point.

J. A. R. M.

GEOGRAPHICAL WORK OF THE GEOLOGICAL SURVEY OF CANADA, 1896.

By Dr. GEORGE M. DAWSON, C.M.G., F.R.S.

THE exploration of geographically new territory by this Survey during 1896 has been less considerable than in many previous years, various circumstances having tended to confine the work more strictly to the detailed examination of comparatively limited tracts. Of exploratory work, however, in which considerable additions to geography have resulted concurrently with geological reconnaissances, Mr. A. P. Low's traverse of the northern part of the Labrador peninsula, Dr. R. Bell's survey in the basin of the Nottaway river, and Mr. J. B. Tyrrell's examination of the country to the north of Lake Winnipeg, may be referred to.

Mr. Low reached Hudson's bay by descending the Moose river from Misainahi station, north of Lake Superior, on the Canadian Pacific railway. From Moose Factory, he coasted the east shore of the bay for about 500 miles to Richmond gulf, the initial point of the new work to be undertaken. Starting from Richmond gulf, a portage-route was followed 75 miles to Clearwater lake, which was found to be about 45 miles long and 20 miles across in the widest part. From its north-east corner a route 10 miles long was followed to Seal lake, which is more than 50 miles long, but from 1 to 5 miles wide only. The watershed passes close to the eastern end of this lake, and was crossed at an elevation of 900 feet above sea-level. A small lake immediately beyond the watershed discharges into the Stillwater branch of the Kokmoak river, which was descended 275 miles to its mouth. The first 65 miles is very rapid and shallow, after which it is easily navigable with canoes.

The country passed through is semi-barren, with small spruce and larch trees growing only in the valleys, the hills being either bare or covered with arctic shrubs. Laurentian gneisses and granites preponderate everywhere, but the Cambrian rocks with iron ores were again met with, forming a wide belt. The ice of the Glacial period flowed, as shown by the rock-striation, both eastward and westward from the vicinity of the watershed, the ice-parting lying, apparently, a short distance to the east of the present height of land. Mr. Low returned from Ungava bay by steamer round the east or Atlantic coast of Labrador.

Dr. R. Bell's explanatory work was in continuation of that accomplished by him in 1895, in the basin of the Nottaway or Noddaway river, one of the largest streams falling into James bay. Some thirteen branches of the main stream were surveyed for parts of their lengths. A canoe-route from Waswanipi lake northward to the Rupert river was also mapped, crossing the valley of a considerable stream, which empties into James bay south of the Rupert, and is sometimes known as the Broad-back river. Several large lakes occur on this route. Dr. R. W. Brock, Dr. Bell's assistant, made a long track-survey up the Waswanipi river to the eastward, eventually reaching Mistassini lake. When the work accomplished has been laid down, it will form a substantial addition to the map, and will enable the distribution of the Huronian and Laurentian rocks, between which the country here appears to be divided, to be represented with considerable accuracy.

Mr. Tyrrell spent the summer exploring the country north of Lake Winnipeg and the lower portion of the Saskatchewan river east of Nelson river, and north of Burntwood and Churchill rivers. No exploration of this country has been made since the days of the early fur-traders, when David Thompson made track surveys of the canoe-routes there. Pine, Wolf, Grass, and part of Burntwood rivers were surveyed, and some additions were made to our knowledge of the geography of the Nelson river, and the lakes into which it expands.

The country was found to be a rather low-lying plain, sloping gradually north-eastward from an elevation of 1250 feet to 550 feet above the sea. The southern portion of the area is fairly level plain underlain by flat-lying Palaeozoic limestone, which on its northern side breaks off in an abrupt escarpment from 50 to 100 feet in height; and thence northward the surface is gently undulating, and is underlain by Archean rocks. Throughout a large portion of the district these rocks are buried under a covering of stratified clay, a deposit of the glacial lake Agassiz, which will furnish rich agricultural and grazing land, and may be of considerable importance in the event of a railway being built from Manitoba to the west coast of Hudson bay.

The progress of the geological mapping of Canada is, unfortunately, retarded very greatly by the want of the necessary geographical and

topographical surveys, which in older countries are placed in the hands of the geologist when he enters the field. There is scarcely any part of the Dominion in which much of the time and energy of the geologist, or of an assistant who may accompany him, must not be spent on the actual measurement and delineation of the country in which he may be at work. Thus it happens that practically every map issued by the Geological Survey constitutes at the same time the best available geographical map of the district covered by it, and includes numerous features never before represented. This is the case even in the older provinces, and, although it would be tedious to follow in detail the various surveys made in many different parts of Canada during the year, it may be stated that these have in all cases added very materially to the geographical features.

ON THE FORMATION OF SAND-DUNES.*

By VAUGHAN CORNISH, M.Sc. (Viot. Univ.), F.C.S., F.R.G.S., Associate of the Owens College, Manchester.

SECT. I.—SCOPE OF THE INVESTIGATION.

THE distribution of pebble, sand, and earthy dust by wind and by water is in present operation over a large part of the Earth's surface, comprising the coast dune-tracts, beaches, the beds of rivers, of lakes, about one-fifth part of the floor of the ocean; the deserts, and the moister districts bordering on them, where is fixed the dust which is continually fanned away from the deserts in which it is manufactured. The author is engaged upon an investigation of phenomena attending the making and distributing of pebble, sand, and dust. The present paper upon the formation of Sand-dunes contains the first instalment of results.

Under the action of a wind of any given strength, pebble, sand, and dust may be differentiated thus: pebble is rolled, but not lifted; dust, when raised, hangs as a cloud; sand may be lifted, but settles quickly. Stuff of which the grains run larger than shot is not usually called sand, but it is difficult to fix a limit of size which shall differentiate sand from pebble, because any increase in the force of wind is accompanied by an increase in the size of grain which the wind can lift. Now, one of the most remarkable phenomena attending the distribution of earthy materials by wind (or water) is the *sorting* action exercised by the fluid. The formation of sand-dunes, as I shall show, is accompanied by and largely depends upon this sorting process; and in the present paper I shall call any earthy material which undergoes sorting by wind, "sand." It is evident that a material cannot be sorted unless it is heterogeneous. It is, of course, conceivable that the sorting might be completed; but the definition will have served its purpose if it holds until the necessity arises for considering such a case.

In this matter of sorting there is a difference between the dunes of deserts and those of sea-coasts, the latter being formed of a material from which the dust has been pretty completely sifted out by the action of water. The building up of coast dunes raises the general level of the land, but wind-action lowers the general level in deserts; for the bulk of the blown sand is less than that of the denuded

* Paper read at the Royal Geographical Society, January 19, 1897.

† See *Challenger Reports*, "Deep-sea Deposits."

rock by the amount of the dust which settles outside the desert, as chaff settles beyond the threshing-floor.

The plan of work adopted in the present research has been to deal first with the behaviour of blown sand upon a *manageable scale*, and then to apply the results to the elucidation of the larger phenomena, which is the method of the experimental sciences. Further, I have kept the phenomena of water-waves constantly in view, and as the research has progressed, I have been confirmed in the opinion that sand-dunes are best studied in conjunction with waves. There is no real danger of pushing the analogies too far, for the small-scale observations enable one to deal with sand in a *molecular manner*, which effectually guards against such mistakes as would arise from treating the material as a mere fluid.

SECT. II.—THE RIPPLING OF SAND BY WIND.

1. *Conditions of Rippling.*—When a wind of suitable strength blows upon loose sand, a mottled appearance is quickly produced, which is the commencement of ripple-mark. I found on the sands at Branksome, in Dorset (between Bournemouth and Poole), that, when the rippling had become sufficiently regular to admit of measurement, the wave-length, or distance from crest to crest, was 1 inch, the average diameter of the sand-grains being $\frac{1}{16}$ inch. The following measurements of the sand-ripples made by wind were taken at different times and in various places between Branksome and Poole Haven. The measurements are given in inches.

Number of observation.	Wave-length.	Mean diameter of sand-grains.	Height of ridge (amplitude).	Number of grains to height.	Length, — Height.
I.	1	$\frac{1}{16}$	—	—	—
II.	$1\frac{1}{2}$	$\frac{1}{16}$	—	—	—
III.	$1\frac{1}{2}$	$\frac{1}{16}$	$\frac{1}{16}$	5 (calculated)	20
IV.	$1\frac{1}{2}$	$\frac{1}{16}$	—	5 (counted)	18
V.	$1\frac{1}{2}$	$\frac{1}{16}$	$\frac{1}{16}$	8	17
VI.	2	$\frac{1}{16}$	$\frac{1}{16}$	5 (calculated)	17
VII.	$2\frac{1}{2}$	$\frac{1}{16}$	$\frac{1}{16}$	7	20
VIII.*	$3\frac{1}{2}$	$\frac{1}{16}$	$\frac{1}{16}$	—	26
IX.	$3\frac{1}{2}$	$\frac{1}{16}$	—	5 (counted)	18½
X.	$4\frac{1}{2}$	$\frac{1}{16}$	$\frac{1}{16}$	—	17
XI.	6	$\frac{1}{16}$	$\frac{1}{16}$	16	18
XII.†	7	—	$\frac{1}{16}$	20	14

From observations III. to XII., I conclude that *amplitude and wave-length increased in the same proportion*. By combining I. and II. with III. to XII., I deduce that *regular rippling was observed with an amplitude of three grains from trough to crest*.

The uniformity of the wind-ripple pattern is at all times remarkable. In water-formed sand-ripples no such uniformity has been recorded except when there has been some agency, besides the resistance of the sand-grains of the ridges, to throw the water into waves.‡ In the case of wind-formed ripples, on the other

* Noted at the time as "hasty observation."

† Smaller ripples were forming on the weather slope.

‡ See G. H. Darwin on "Ripple Mark" (*Proceedings Royal Society*, 1883-4), and a paper on "Ripple Mark" by the present writer (British Association, Liverpool Meeting, Sect. C (Geology)).

hand, I concluded, from the fact that the wave-length increased steadily with the time during which the wind blew, that the sand-grains were the source of those regular undulations of the air the existence of which is attested by the uniformity of the ripple pattern. This conclusion I was able to verify by the artificial reproduction of the ripples by means of the steady blast employed in sand-blast work. The experiments were carried out at the London Sand-blast Works, Gray's Inn Road, W.C., where a room, with the requisite machinery, and the services of a workman, were kindly placed at my disposal by the proprietor. Sand, both sorted and unsorted, was of course to be had in abundance. The blast was first turned upon a quantity of sand taken from a box which served as receptacle for the sand swept from the floor of the room. In a few minutes the surface became rippled, and the ripples grew in height, in wave-length, and in regularity, under the constant blast.

I then tried a coarse assorted sand from which all fine stuff had been carefully sifted.* In this no rippling was produced even after long-continued blowing, either with a gentle blast or with a wind so powerful that the grains rattled as they rolled and jumped along. On mixing the coarse (assorted) with a finer (assorted) sand, rippling was, however, quickly produced. The finest variety of the assorted sands (which was found to contain a considerable number of grains of larger size) was also quickly rippled.

These experiments, and others which confirmed them, illustrate in a very striking manner how heterogeneity controls the tactics of sand. Taken in conjunction with the observations of natural ripples, they enable me to state the following

LAW OF RIPPLING BY WIND.

The rippling of sand takes place when the eddy in the lee of the larger grains is of sufficient strength to lift the smaller.

The statement connotes that if the wind be too strong for the larger grains to stick and make an eddy, there is no rippling—all is as dust before the wind. If, on the other hand, the eddy be too weak to lift the smallest grains, the material behaves as a bed of stones or pebbles.

2. *The Profile of Ripples.*—The profile of all the ripples measured in the sand at Branksome is approximately a triangle having a windward angle of 4° , and as the leeward angle the maximum resting slope of the sand (see Fig. 1).

FIG. 1.—PROFILE OF WIND-FORMED RIPPLES—FIRST APPROXIMATION.

In order to represent the form more exactly—a matter important in its bearing upon dunes—the windward slope must be drawn, not as a straight line, but a curve having an inflection near the middle. Below this the curve is hollow-backed, above it is round-backed—a shape very like that of the weather slope of the wind-forced waves of water. The stream-lines of air which give this shape to wind-ripples in sand may be inferred from Fig. 2, which is Prof. G. H. Darwin's representation of the stream-lines when a current of water is made to flow over existing water-formed ripple-mark. As a witness to the great activity of the eddy in the apparently sheltered troughs of wind-formed ripples, I may call attention to the curiously scoured look of the surface of the sand under the steep lee slope. The surface is often finely striated in the direction of the wind by the action of

* By artificial means; we are now dealing with a manufactured product.

the lower part of the eddy, which action is in the same line as that of the wind, although opposite in sense.

The long flattened vortex, or eddy, hollows the lower part of the windward slope, while the descending portion of the superincumbent (air) billow rounds



FIG. 2.—WATER-FORMED RIPLETS MADE UNDER CURRENT ACTION, SHOWING STREAM-LINES.

off the upper part of the slope. Finally, the lee slope of the wind-formed ripple is not necessarily all straight line (as shown in Fig. 1), but may terminate in a curve. Thus the normal profile left by the rippling of sand by wind has the following parts: viz. a windward slope, consisting of a concave and convex curve; and a lee slope, consisting of a straight line and a concave curve (see Fig. 3).

FIG. 3.—PROFILE OF WIND-FORMED RIPLETS, SECOND APPROXIMATION.

The straight line is due to the incoherence of sand, which causes it to slip, and thus prevents it from taking the cusped form which is reached in wind-forced water-waves, owing to their quick travel.

In a sudden violent squall at sea, when the motion of the wave is slow relatively to the motion of the wind, it is hardly possible for a cusp to form, the tops of the billows being cut off and drifted away as a white spray. Similarly, I have not observed any cusp in the slow-moving sand-ripples even during the continuance of the wind, when the grains on the lee side have the support of the eddy.

A curve at the bottom of the lee slope can be produced (in deep sand) by the excavation of the eddy, but under other conditions, particularly on the large scale in dunes, the gentler slope at the bottom of the lee face may be a talus derived, first, by the coarsest grains rolling from the summit beyond the foot of the steep slope; and, second, by a *sediment* composed of so much of the finer sand caught by the eddy as has not been again tossed away. Some of this sediment may also be found upon the steeper part of the lee face.

I have now to deal with the profile of a *group* of ripples, and to explain the mechanism which maintains constant the ratio of amplitude to wave-length in a group. The backward motion of the eddy arrests the forward motion of the larger grains rolled up the weather slope, and thus co-operates with the direct current of wind in raising the crest. The vertical motion of the eddy gouges out the finer grains from the trough; raises them to the crest; whence, in co-operation with the wind which blows over the ridge, it seeds them flying to leeward, along with the finer parts of the sand which drifts up the weather slope. Thus the amplitude of the ridge is increased by simultaneous excavation and elevation. Whether the increase of amplitude of the ridges is accompanied by a raising or a lowering of the general level of the sand depends upon the quantity of sand which is supplied from more exposed situations, and upon the strength of the wind. At the moment of failure of each gust of wind, the pattern is smoothed or even blurred; the recurrence of the gust restores the sharpness to the pattern. With a thick sand shower, however, it may happen that no rippling occurs, for the

surface may be renewed so quickly that wind has no time to make ripples. Similarly, where the surface of water is constantly renewed (from below) the water has a smooth, oily look, because wind has no time to ruffle it. If the supply of sand diminish, the eddy, after a time, cuts down to the bottom of the loose sand; a number of isolated ridges are left, resting upon a hard bed; and in these, if the sand shower fail, the wind will force the windward to us steep a pitch as the leeward slope (Fig. 4).

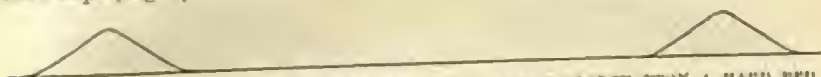


FIG. 4.—PROFILE OF A GROUP OF WIND-FORMED RIPPLES ISOLATED UPON A HARD BED.

The ridges of wind-formed ripples advance almost entirely by the rolling of the larger grains of the top layer over the crest. The motion is slow, for the eddy opposes the wind; one foot per hour would be pretty good travelling. The rate of advance of a ridge diminishes with increase of amplitude, for the advance is by rolling of the top layer, and the number of layers of sand-grains is proportional to the amplitude. A growing ridge consequently lags, thus increasing its distance from the next leeward ridge. Again, the increase of height of the windward ridge is accompanied by increase of strength of the eddy and by increase of length of the air-hillow which tops the eddy, so that the sand shower is thrown further to leeward. This is a part of the mechanism by which the ratio of amplitude to wave-length is kept constant. The remaining part of the mechanism is the quicker travel of lower windward ridges, which results in their catching up and becoming merged in the ridges to leeward, as will be described in the next sub-section.

During the whole process of rippling by wind, the sand is being winnowed, the smallest grains being transported furthest, so that when the wind has blown for some hours, one may see, at the weather end of a group of ripples, isolated ridges of coarse sand upon a hard bed (of which the windward may be as steep as the leeward slope). Further to leeward the troughs are not cut down to the hard bottom, but here the sand is much coarser in the upper than in the lower layers of the ridges, showing that the finer sand has been carried away from the surface. Still further to leeward the rippling has a beautifully smooth look, the sand being much finer than the ordinary sand of the locality.

3. *The Ground Plan of Ripples.*—In order that ripples, the ridges of which are transverse to the wind, may be produced, the sand must contain an abundance of grains which offer sufficient resistance to produce an eddy. Groups of these give the mottled appearance* which precedes the formation of regular ridges. These patches extend themselves transversely by a mechanism similar to that which increases the height of the ridges (the eddy opposing the direct current, and thus arresting the motion of the larger grains). The process must be imaged as taking place in plan instead of in profile. The original patches thus quickly unite at their ends in transverse chains. The lateral dimension of the ridges increases much more quickly than the wave-length; I have known ridges increase from 2 inches to 20 feet laterally, whilst the simultaneous growth of wave-length was from 1 inch to 3 inches. This was on a bed of loose sand, where the eddy can excavate in shelter. The quicker travel of the lower ridges (which was alluded to in the last sub-section) is a part of the mechanism by which the ripple pattern acquires its

* Compare the reticulated pattern produced at the moment when a gust strikes the surface of water before the waves have had time to spread, and the little balls of fleecy cloud, like puffs of smoke, which sometimes form so quickly over the sky, and presently coalesce in parallel bars.

surprising uniformity, the lower ridges becoming merged in the larger, the younger in the older. Fig. 5, drawn from observation on the beach of Hale, in Cornwall, illustrates this curious process. Along *OK*, ridges 2 and 3 have already joined. On the line *AB*, 2 has a small amplitude, as shown in the section, and will soon

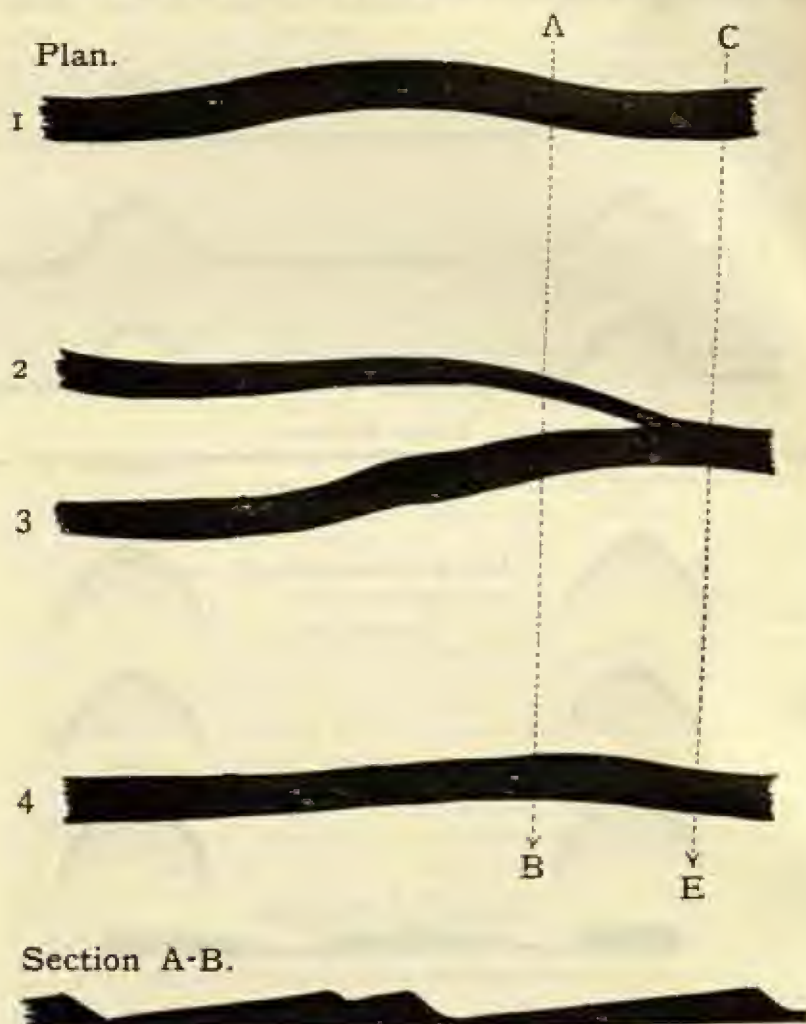


FIG. 5.—THE COALESCENCE OF RIPPLES.

catch up 3. The broad black bands in the plan indicate the short leeward slopes of the ripples; the intervening spaces are the long windward slopes.

Beyond the edges of a patch of loose sand the lateral growth of the ridges proceeds with difficulty, for on a hard bed the eddy cannot excavate, and the wind has more driving power. The ends of the ripple ridges at the edges of the patch of loose sand are curved forwards, so as to be concave on the lee side. I have seen rippling in coarse sand on a hard bed (the pathways by the roadside at Torquay)

in which the short, curved, broad ridges had the shape of a five-days'-old moon. The importance of this cusped form will appear later on.

It remains to describe some phenomena of rippling which are interesting for the light they throw upon the origin of longitudinal dunes, and of the longitudinal rows of horseshoe depressions which are known as *fuljes* in Arabia. I observed

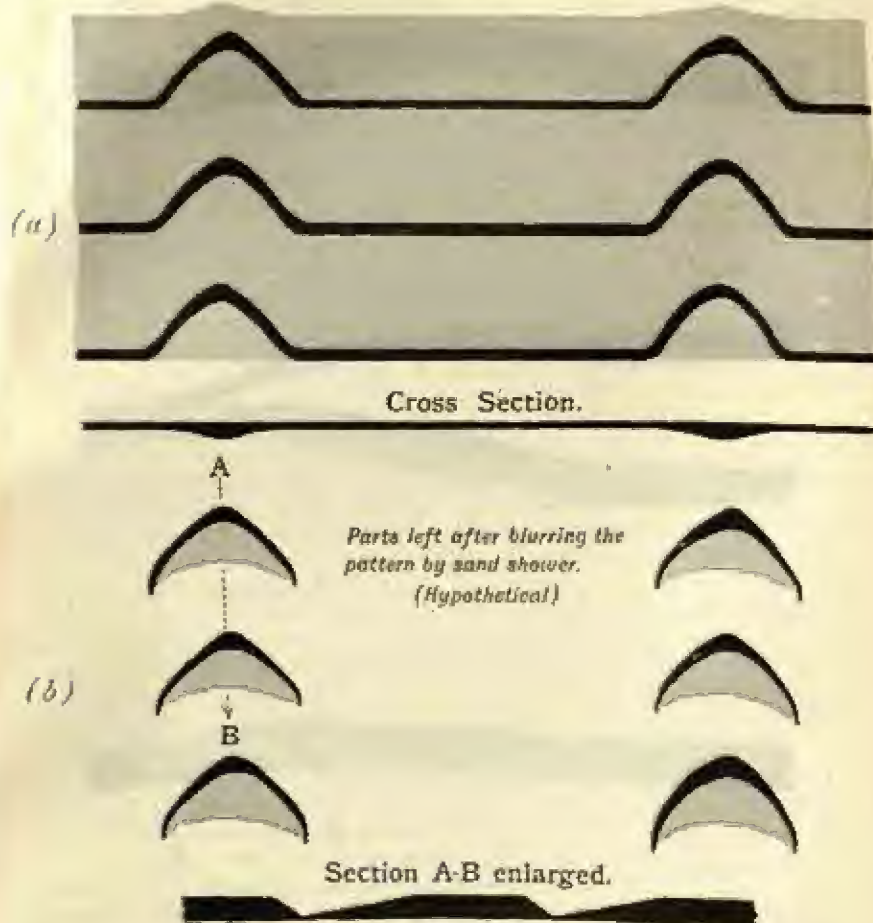


FIG. 6.—RIPPLE STRUCTURE HOMOLOGOUS WITH "FULJES."

the phenomena referred to in the mobile shell sand of Hale, in Cornwall. A brisk wind had been blowing for some hours over a large, deep, and nearly level bed of the dry shell sand, which was covered with a very regular rippling of about 3 inches wave-length. Standing with face to wind, I noticed that at slightly irregular intervals, of about 12 inches on an average, parallel rows of markings occurred, which could be followed for a long way from ridge to ridge, the direction of the rows of markings being at right angles to the ridges—that is to say, parallel to the wind. Closer examination showed that each of these markings was a blunt arrow-headed inflection in the ripple ridge, the arrow-heads pointing up wind (Fig. 6, a). In the arrow-heads the troughs were deeper than in the straight portions,

but I did not notice that the crests were higher. At the apex of the arrow-head the trough was, I think, deepest. I particularly noticed that the sand-grains at the arrow-heads were much coarser than on the straight parts of the ridges. This shows clearly that along the lines of the arrow-heads the wind had greater power than elsewhere. The eddy, as well as the wind on the crest, was consequently stronger, and, as compared with the other parts of the ridge, excavation had the advantage as compared with elevation. Along the lines of the arrow-heads, the ratio of amplitude to wave-length was greater than in other parts of the bed of sand.

The arrow-heads pointed up wind, showing that the ampler portions of the ridge had lagged during the march of the ridges. This is the general rule, but it may seem strange that it should hold in a case where the greater amplitude is due simply to exposure to a stronger wind. It must be remembered, however, that in a stronger wind many grains are whirled from the crest which in a gentler wind would roll down the lee slope, and thus contribute to the advance of the ridge.

Now, suppose that the sand shower increases so that all but the deeply cut parts of the pattern are smoothed over. The pattern left would be that shown in Fig. 6, *b*, which gives (1) the form of the fulges, (2) the mode of their arrangement, (3) the manner of their occurrence as holes in a bed of deep sand (see § IV.). It is also important to note that if the sand shower failed, the wind remaining as before, channels would be cut in the sand along the lines of the arrow-heads.

I shall now pass on to the study of dunes, which is closely allied to that of rippling, but in which some new factors are introduced. The first of these is the *time factor*. Ripples are so small that, practically, their form is always that impressed by the wind which is actually blowing; or, if we observe them in a calm, by the wind which last blew. A permanent dune is so large that the wind never holds sufficiently long to obliterate the effects of former winds. Thus *size alone may make a dune a permanent hill even if it be composed of loose sand throughout*. Given a constant climate, a large desert dune might conceivably outlast the highest mountains, for the denuding agent renews the surface. On the other hand, there is a necessary limitation of the process by which dunes grow, which prevents their attaining heights equal to those of mountains formed by erosion. The winds have greater power at considerable elevation than near the surface of the ground, so that, even if a group of sand-hills of excessive height were piled up artificially, more sand would be removed from the summits than the wind would bring, and this lowering of the summits would not be compensated by the deepening of the troughs, the work of the wind at the summits being assisted, and that in the troughs being hindered, by gravity. The result would be to form an elevated desert of deep sand surmounted by dunes of moderate height. In the case of a group of mountains formed by the cutting of valleys, the limiting height of mountain above valley is not so readily attained, for the "head" of water increases with the depth of valley, and gravity does not act in opposition. The forms of dunes, and of groups of dunes, have a greater variety than those of ripples, and are often more complicated, for a dune may register the impress of many changing winds.

Another important difference between the small-scale and large-scale phenomena is that in the latter the *heterogeneity of wind* is much more important. In this term I include both *intermittence* and the want of uniformity of the cross-section of a sheet of wind. Unlike wind-ripples, dunes do not necessarily owe their origin to the resistance of the sand-grains. In the case of transverse dunes in deep deserts there appears, however, to be actual continuity between ripple and dune, the latter being (on this supposition) old ripples. Rippling action plays a part in the shaping of every dune.

SECT. III.—THE VERTICAL SECTION OF DUNES.

There is a great variety of shapes proper to dunes. Instead of dealing with the different shapes *separatim*, I prefer to consider all varieties together, first in section, and then in plan. The grouping of dunes has also to be considered, which I do by dealing with the profile of the groups in the present section, and with their ground plan in Sect. IV.

The profile of dunes corresponds to what is generally called the form of a wave, viz. the section in the direction of the wave's motion. The cross-section, which is less characteristic, will be dealt with more shortly.

The lee slope of dunes is the angle of rest of the sand, and therefore varies slightly. The practice of making the vertical scale greater than the horizontal should not, I think, be followed in representing dunes. The windward slope may be of any steepness up to the natural limit of the angle of rest. In dunes formed by a dominant wind in deep sand, the windward slope varies somewhat with the density of the sand shower (tending to decrease the angle) and with the power of the wind (tending to increase the angle), but in no case is the slope a steep one. The profile is comparable to that of wind-formed ripples; the amount of sedimentation upon the lee face of dunes is, however, greater than in ripples.

On a hard bed the windward slope may be forced by the wind to the angle of rest when the sand shower falls, and in this case the dunes are widely separated. On the other hand, wind blowing outwards from a deep sand tract forms a horizontal plateau terminated by a talus as steep as the sand can rest. Under these conditions the encroachment of sand recalls the manner of advance of a glacier, and to this formation I restrict the term "sand glacier."

Reversible wind can produce dunes having both the front and the back steep, without failure of the sand shower, even in a deep sand deposit. The form differs from that of dunes produced in deep sand by a dominant wind, in much the same way that the forms assumed by two sets of sea waves when meeting fairly and crossing differ from the form of an ordinary sea wave running before the wind.* The formal analogy is very close, although the "short sea" which is said to last for a time after the wind has suddenly blown round is perhaps a better physical analogue. The first effect of reversal of wind, as Dr. Sven Hedin has pointed out, is to turn the top of the dune (Fig. 7), and the occurrence of such a double slope is

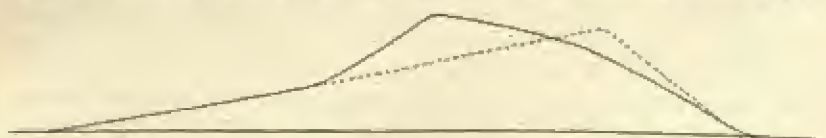


FIG. 7.—THE FIRST EFFECT OF REVERSED WIND, TURNING THE TOP OF THE DUNE.

sure evidence of changed wind. The more frequent the reversal of wind and the larger the dune, the more nearly do the conditions correspond to the oscillation by which the knife-edged sand-ripples of the sea are formed. In a deep sand tract where dunes are growing in reversible wind, groups are formed in which the greatest ratio of amplitude to wave-length occurs. It was pointed out in Sect. II., (2), that when a windward ridge increases in amplitude it lags, travelling more slowly than a lower leeward ridge, the distance between them therefore increasing. By such adjustments the smaller ratio of amplitude to wave-length is speedily restored in ripples, but on the large scale in dunes the adjustment requires much

* See Dr. Sven Hedin in the *Geographical Journal*, October, 1891.

time, and is frequently incomplete when the wind drops. Suppose this wind to have been from the west, and let the wind next blow from the east. The eastern ridge at first approaches nearer to the western, for, being of smaller amplitude, it moves faster. Its motion may be retarded by increase of amplitude, and when its amplitude is equal to that of the western ridge it will no longer diminish the distance between them. The increase of amplitude has, however, further increased the ratio of amplitude to wave-length. A group of dunes in which this ratio is as great as possible, I call a group of "shortest dunes." If the angle of rest of the sand be $33\frac{1}{2}^{\circ}$, then the narrowest sand-hill is three times as broad as it is high, and if such hills be placed side by side (Fig. 8), the distance from crest to crest is three times



FIG. 8.—THE SHORTEST AND CLOSEST (ARTIFICIAL) SAND-HILLS.

the height, or amplitude. Thus a limit is imposed by gravity upon the shortness of a dune and upon the closeness of a group of dunes. The above figure gives the profile of such shortest sand-hills as might be piled up with a spade; the shortest and closest *dunes* (sand-hills formed by wind) would be better represented by Fig. 9. In speaking of the amplitude instead of the height of dunes, one avoids a common source of confusion, due to the fact that the vertical distance from trough to crest may increase by the lowering of the trough as well as by the raising of the crest. It is only in the case of dunes isolated on a hard bed that "the height of a



FIG. 9.—THE SHORTEST AND CLOSEST DUNES (SUBJECT TO REVERSIBLE WIND).

dune" can be spoken of without ambiguity. The deepening of the troughs during strong wind, which has been mentioned in connection with my small-scale observations, has been observed on the large scale by M. G. Grandjean.* In the centre of a dune tract exposed to reversible wind, the tops of the dunes attain the greatest elevation above the surrounding country. In a section of the coast dunes of Gascony given by M. Grandjean in the paper just referred to, the amplitude is greatest where the maximum elevation is attained. In broad dune tracts, such as are met with, for instance, in Arabia, the greatest amplitude would not necessarily coincide with the greatest elevation, for the amplitude of the dunes does not depend only upon the supply of sand, but upon a sufficient force of wind. A heavy sand shower in a falling wind increases the general elevation of the deposit of blown sand, but diminishes the amplitude of the dunes; much in the same way that a quiet fall of snow raises the level, while smoothing the contour, of a country. The statement that the growth of dunes is proportional to the difference between the

* "Les landes et les dunes de Gascogne," *Bull. Soc. Geogr. Com. de Bordeaux*, March, 1896.

amount of sand brought and the amount removed by wind, only applies, therefore, to dunes isolated upon a hard bed, for the greatest difference is when no sand is removed, under which condition, in a deep desert, the dunes would be obliterated, an elevated sandy plain being formed.

Where dunes are diminishing in reversible wind, they have, again, a symmetrical form, but this tendency is to leave a smoothly rounded surface such as indicates the failure of the *toasing* action of the eddy. The surface of a country covered with such dunes would have the form of a rolling prairie (Fig. 10). I deduce two sets



FIG. 10.—DEGRADED FORM OF DUNES SUBJECT TO REVERSIBLE WIND.

of conditions for producing such a surface, viz. (1) "leeward" position in a desert where sand which has been sifted from all the coarser grains deposits in light winds; and (2) exposed parts of a desert where mounds of pebbles* are left (perhaps from steeper dunes of which they are the relic) when all the finer sorts of sand have been winnowed away. These forms recall the ground-swell of the ocean. The sharp crest of a dune is where the sorting action goes on; when, as in the above cases, there is very little sorting action there is no longer a sharp crest. In like manner the ground-swell owes its smoothly rounded billows to the absence of that wind-eddy which supports the lee slope of a storm-wave, and assists in sending from its sharp crest an intermittent shower of spray.

With regard to the cross-section of dunes (a term, by the way, which has no significance where winds blow from all quarters), the sides or flanks of *growing* dunes appear to be gently sloping curves. Steep straight sides sloping at the angle of rest indicate depletion by scouring (Fig. 11).

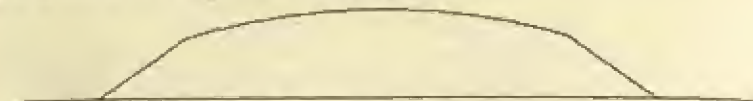


FIG. 11.—CROSS-SECTION OF DUNES WITH FLANKS SCoured BY WIND.

A steep, straight slope, where the sand has slipped owing to the scour of wind, may easily be mistaken for the leeward face of a dune. Where the depletion has proceeded until the two scoured sides meet at the crest, giving a knife-edge, the form may be mistaken for the production of reversible wind. From this moment the continuance of a scouring wind will preserve the shape, but diminish the height and breadth of the dune. Thus modes of degradation as well as modes of growth must be taken into account in studying the forms of dunes.

SECT. IV.—THE GROUND PLAN OF DUNES.

The study of the ground plan of dunes corresponds to that of wave patterns—a neglected part of the science of waves. Dunes are waves produced in sand by wind, and two factors determine the wave pattern, viz. the rippling action and the current action. Rippling tends to produce (transverse) bars, current tends to produce (longitudinal) stripes, and the wave pattern is a compromise between the two. Similarly, in a gentle stream the front of the wave made by a stone or pebble has the form of a blunt arrow-head pointing up stream; in a

* Compare Fig. 19, "Kiewitz," in Prof. J. Walther's 'Die Denudation in der Wüste,' which shows the gently rolling surface of a pebbly desert.

torrent the swift current lengthens the arrow-head almost to a stripe, the limiting case being the striping of a waterfall or of the crest of a breaker. The transverse growth of a dune is the spreading of a wave; the drift of the sand to leeward is the flow of a stream. I shall show that the tactics of sand are such that the two velocities—the wave-spreading and the wave-making * which accompanies the drifting of the sand—do not vary the one as the other, and that this is why the greatest

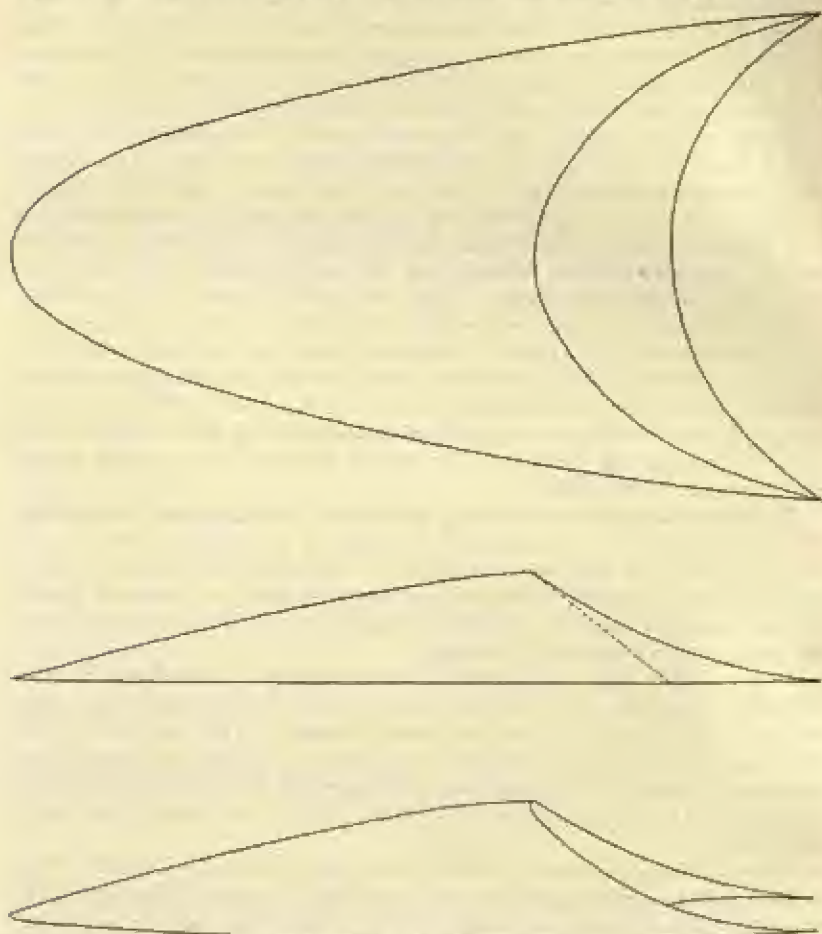


FIG. 12.—BACHANE OF THE SAHARA.
(Adapted from G. Hottel.)

extension of a dune may be either transverse or longitudinal, *i.e.* at right angles to, or in the direction of, the wind.

When a moderate wind blows upon deep sand, the conditions are favourable to the production of ridges of great transverse extension, for the eddy burrows along sideways in shelter, and the forward current, flowing over the loose sand, has

* Expressed more generally thus—the rate at which a disturbance is created, and the rate at which it spreads.

very little driving power. At the edges of the bed of loose sand lateral growth proceeds with greater difficulty, for the lower layers of air derive additional driving power from the spring imparted by the hard elastic bed. Thus the sand-grains drift more freely, and even if the motion of the sand be arrested so as to form an eddy, the work of the eddy is handicapped by the circumstance that it cannot excavate.

The dunes called *barchanes* usually have their greatest extension in a longitudinal direction (Fig. 12): This form occurs in the Sahara,* in Central Asia,† in Peru‡ (where they are called *medanos*), and probably in other localities also. They form here and there upon the desert floor where the wind will let them. It appears that they neither occur in localities where the sheet of wind has everywhere the complete mastery over the sand, nor where the burden of the flying sand is everywhere too great for the carrying power of the wind; they dot the desert plain in localities where the sheet of wind has, for the most part, the mastery of the sand, but drops its burden here and there at certain points, or more probably along certain *stripes*. A rapid current of air can no more flow smoothly and with uniform strength over the ground than a rapid current of water can flow uniformly upon a rough channel or between winding banks. Wherever there are opposing lateral deflections, there is a double burden of sand, with a current relatively, perhaps absolutely, feebler, and here the sand drops. The lateral growth of the nucleus thus formed is slow, for the reasons already explained, but its longitudinal increase may be rapid, for the rapid current of air may carry past the edges of the dune great quantities of sand which, meeting with laterally opposing motions on the lee side (see Sect. V.), are there dropped and become part of the dune.

The *horns* or *cusps* of the barchanes, pointing to leeward, are readily explained, for the lowest parts of the dune travel quickest. A form as of the moon in her first quarter (i.e. with the cusps pointing in the direction of motion) is the form of front proper to a travelling sand-wave—as viewed in plan. In this case gravity does not operate, so that the incoherence of sand does not hinder the formation of the cusp as it does in the profile of dunes.

It has already been shown that, when the supply of sand fails, the wind increases the steepness of the weather face of a dune. The corresponding alteration in the ground plan of a barchane is the shortening of the body of the dune and an increased development of the horns (Fig. 13). The case is similar to the widening of the angle of the track of a steamer when the speed of the vessel is decreasing, the waves maintaining their speed, but the wave-creation proceeding more slowly.

Fig. 14 shows a permanent, practically stationary, conical dune, such as would be formed from a barchane which had been exposed to winds from all quarters under conditions favourable to growth. The sun's rays have probably assisted to preserve the conical form. Heated air commonly rises in spiral whirls, evidence of which, in our own climate, is afforded by the shape and distribution of the cumulus clouds which form in the sky on a summer morning. It is easy to see that a conical dune, under the rays of the sun, will be the centre of a whirl of ascending air, which will catch the flying sand and help to build up the cone.

A barchane exposed to a dominant wind under conditions favourable to growth, would become a permanent and practically stationary longitudinal dune, such as

* See Bolland, *Bull. Soc. Geol. de France*, 3^{me} ser. ix. and x., 1880-81.

† See Hallow, *Geographical Journal*, xlvii.

‡ See Bolland, *Geographical Journal*, xxx., 1881.



FIG. 13.—BACHANE, AFTER EXPOSURE TO WIND IN A FALLING SAND SHOWER.

is found in Sindh. The Great Indian Desert, having been carefully mapped, affords an unusual opportunity for the convenient examination of the plan of dunes over a large area. The winds of the district are the south-west and north-east monsoons, the former of which is the stronger; and the supply of sand comes from the south

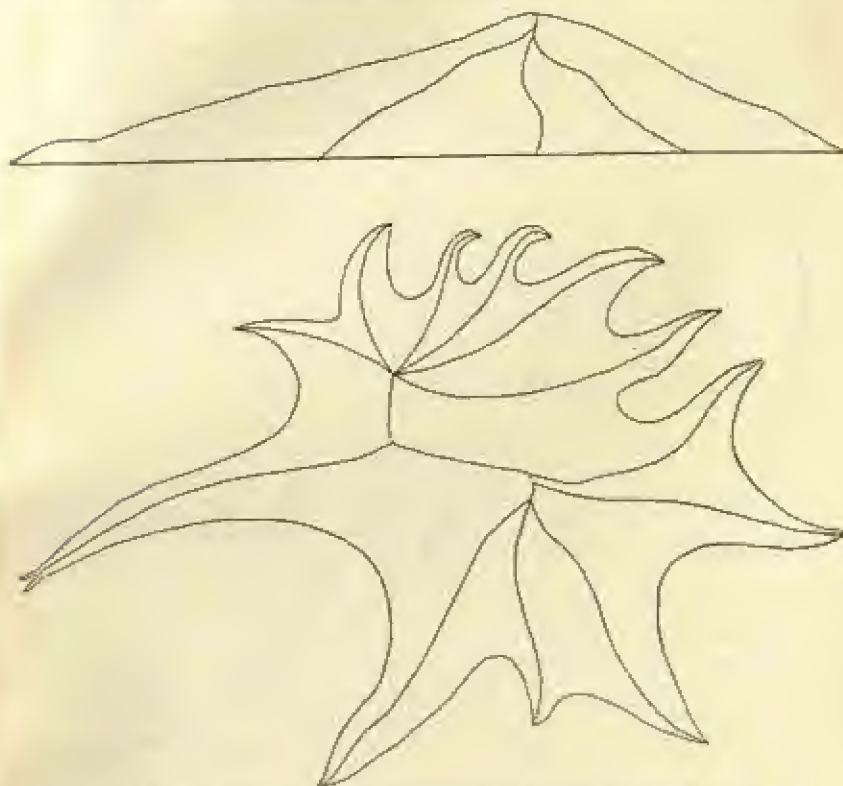


FIG. 14.—STATIONARY CONICAL DUNE OF THE SAHARA, HEIGHT 32 METRES.
(After Schöner.)

and west. Near the Haun of Cutch the dunes are longitudinal (Fig. 15), further inland they are transverse (Fig. 16), and between the districts shown in these figures an intermediate form is shown upon the maps (Fig. 17). In this desert the shower of sand appears to fall as the wind falls, and, instead of a deep deposit of blown sand in the inland districts (such as there is in the Neffth of Arabia), there are isolated transverse dunes. The appearance of the longitudinal dunes upon the map recalls that of the *stripes* of sand which are laid down upon a sandy beach at each lull of the breeze upon a windy day. Mr. Blandford, in his admirable description * of the dunes of the Indian Desert, clearly states that the longitudinal type is associated with a greater force of wind. He also states that the steep slope on the north-east or lee end shows that no theory of accumulation under the lee of bushes will account for the facts (see also Sect. V.). This conclusion is strengthened by the *distribution* of the dunes, which, although not uniform, is systematic. The

* 'Geology of India,' 2nd edit. p. 455, *et seq.*

coasts probably originates the prevalent idea that a dune ought to be a transverse ridge. I wish to point out that, *the source of the sand-supply of coast dunes being itself a long strip transverse to the dominant wind*, the whole group has of necessity an exaggerated lateral extension; and, where the sand-supply is copious relatively

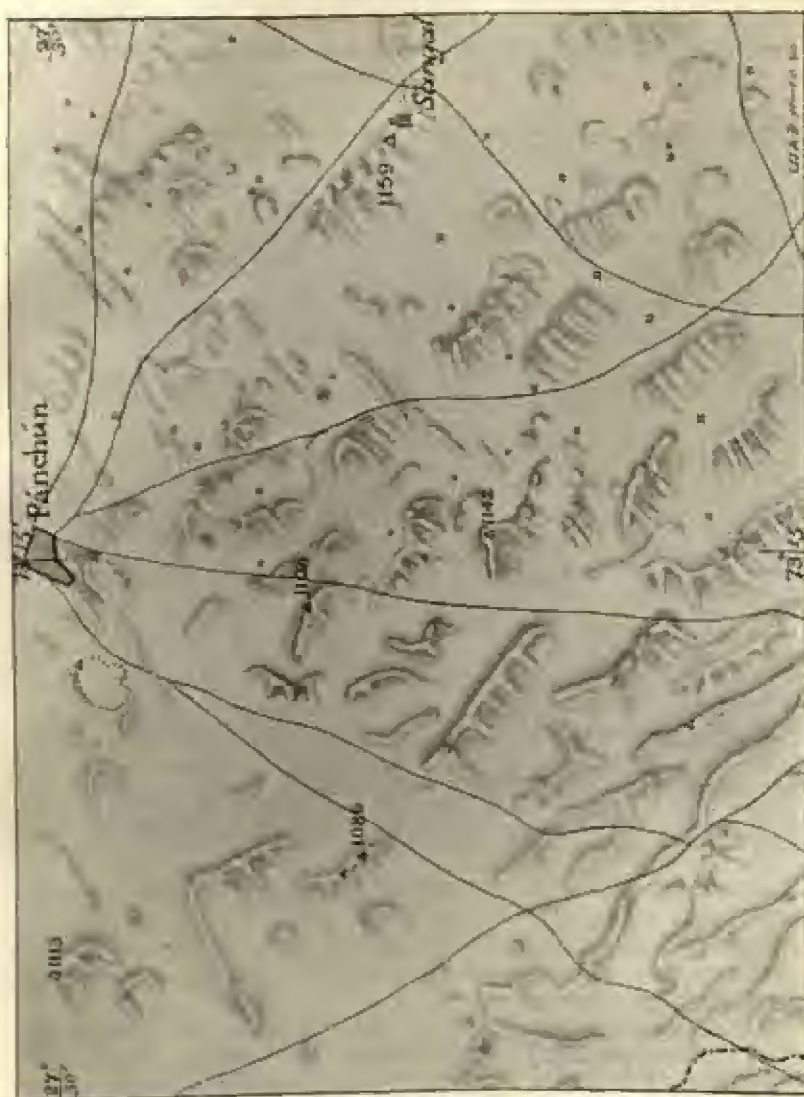


FIG. 10.—TRANSVERSE DUNES OF THE INDIAN DESERT. (SCALE 1 INCH = 2 MILES.)

to the force of the wind, individual longitudinal coast dunes tend to merge in one another, forming a ridge of which the greatest extension may be transverse. Where the wind has more mastery over the sand, coast dunes clearly show the longitudinal development.

The longitudinal ridge and the transverse ridge are the completed forms of dunes due to a wind whose direction does not change, one or other form being taken

according to circumstances, the most important of which is the strength of the wind.

Where the winds blow from all quarters these primary forms are no longer evident, and the ground plan of the dunes may be of every shape. Such a dune tract may be comparable to the curiously corrugated surface of open sea exposed to variable winds (which is carved into furrows and ridges, basins and mounds, pits and pyramids); or it may resemble the troubled surface of the water in rapids of a stream, in which waves are created at a great rate, but spread slowly. To any case the principles already explained may be applied. In addition, it is sometimes necessary to take into account the shifting of the position of the source of sand, particularly on coasts where the sea has receded, and on the sand-spits which grow at the mouths of rivers.

Under the present heading, "Ground Plan of Dunes," I must discuss fully those curious hollows in blown sand, called *fuljes* in Arabia, to which allusion was made in Sect. II., (3).

Mr. W. S. Blunt considered that the prevailing wind in the district of the

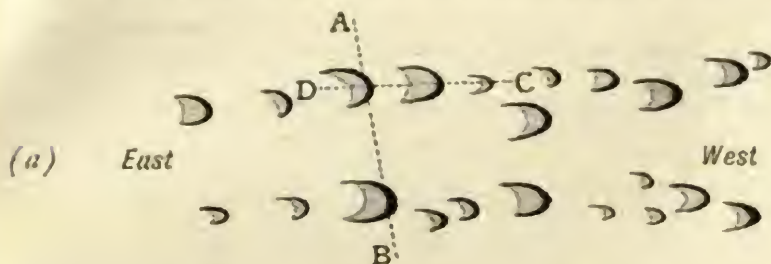


FIG. 17.—DUNES OF THE INDIAN DESERT INTERMEDIATE BETWEEN THE LONGITUDINAL AND TRANSVERSE TYPES.

Nefūd of Arabia which he visited was easterly. The eastern portion of the tract, he says, "is but a series of long strips, from half a mile to 5 miles in breadth, separated by intervening strips of solid plain," but on the north "the transition from the bare gravel plain of the Hamād is very startling. Its edge is so well defined that it is hardly an exaggeration to say that with one foot a man may stand upon the Hamād and with the other on the Nefūd; nor is there much irregularity of outline. The limit of the sand for several hundred miles runs almost evenly from east to west, and it is only at these extremities that it becomes broken and irregular." The following sentences have been italicized from Mr. Blunt's description* of the *fuljes*: "The most remarkable phenomenon of the Nefūd are the *long lines* of horseshoe-shaped hollows, called *fuljes* (Fig. 18, a), with which its surface is *pitted*. These are only observable where the sand has obtained a depth of 80 to 100 feet, and are consequently seldom found in the intermittent portion of the Nefūd, while it is remarkable that *in the very centre of all, where it might be*

* See Appendix to the 'Pilgrimage to Najed.'

supposed the sand was deepest, the fuljes are less deep than towards the northern and southern edges, while the lines in which they run become more regular. . . . The fuljes themselves are singularly uniform in shape, though varying in size. They represent very closely horse tracks on an enormous scale—that is to say, a half-circle deep at the curved end or toe, and sheeling up to the level of the plain at the square tail or heel. The sides of the former are as precipitous as it is in the nature of sand to be, and they terminate abruptly where they meet the floor of the fulj. I noticed that just west of the fuljes there is generally a high mound of sand, which adds considerably to their apparent depth. The deepest of those I measured proved to be 280 feet, including the sand-hill, which may have been 50 feet above the general level of the plain; its width seemed about one-quarter of a mile. . . . At



Section A-B enlarged.

(b)

Section C-D enlarged.

West

East

FIG. 18.—FULJES OF THE ADRIAN NEFFID.
(Adapted from W. S. Mearns.)

the bottom of these deep fuljes solid ground is reached, and there is generally a stony deposit there such as I have often noticed in sandy places where water has stood. This bare space is seldom more than a few paces in diameter. I heard of, but did not see, one which contained a well. The fuljes, I have said, run in strings irregularly from east to west, corresponding in this with their individual direction." Omitting for the present to take account of the small dune near the curved end, the longitudinal section of a fulj may be represented as in Fig. 18, b; that is to say, there are two slopes corresponding to those familiar in dunes—one gentle as that up which sand drifts; and one steep, as that down which the (larger) sand-grains roll.

Drainage, even if adequate to keep such large holes constantly emptied, would not produce these characteristic "windward and leeward" slopes.

In the Neffid the sand has accumulated faster than the wind could remove it, and under these circumstances a pit in the underlying rock, being a place of shelter, would have a greater depth of sand than the surrounding country.

Dr. Euting endeavours to avoid the difficulty of explaining a sand-pit having

the characteristic slopes of a dune by regarding only the sand-mass between the pits. When the fuljes are contiguous, the intervening sand-masses have the form of dunes (Fig. 19), and the suggestion of Dr. Euting is therefore a contribution



FIG. 19.—DR. EUTING'S HYPOTHETICAL PROFILE OF CONTIGUOUS FULJES.
(From Prof. J. Walther's '*Die Denudation in der Wüste*.')

towards the solution of the problem. The supposed kernel of rock shown in Dr. Euting's figure is, however, superfluous, for his row of dunes is such as is normally produced by wind. When, as seems to be usually the case, the fuljes are not contiguous, the intervening sand-masses have not the form of dunes, and we cannot, therefore, escape by Dr. Euting's device from the necessity of explaining the shape of the pits.

It is conceivable that pits of this form could be dug out by downward swirls of wind, the steep slope being then on the lee side of the pit. A swirling stream flowing over a sandy bottom digs such holes, but I have never seen wind dig holes in blown sand after this fashion.

I have, however, observed and described (see Sect. II., (3)) a mode of action of wind whereby horseshoe spaces are kept wholly or partially clear of sand during a sand shower. If my description of this phenomenon be compared with Mr. Blunt's description of the fuljes, it will be seen that the action which I observed accounts (1) for the occurrence of pits in a deep desert, (2) for pits having the very characteristic profile of the fulj, (3) for their cross-section, (4) for their ground plan, (5) for the arrangement of the pits in rows parallel to the direction of the wind, (6) for the fact that the depth of the holes is not proportional to the depth of the sand deposit, (7) for the fact that the fuljes are seldom found in the sand of the Intermittent Nefūd (the strips of hard ground between the sand-ridges being the positions where such rows of pits would have been, but that the wind has there had too complete a mastery over the sand).

It will be observed that the process of formation of fuljes is allied to that of the laying down of a dune tract in longitudinal ridge and furrow. The fact of such a connection was recognized previously to my observations. Mr. Blunt says, "Mr. Blandford suggests that the fuljes are spaces unfilled with sand, and if this be so the strings of fuljes may in reality mark the site of such bare strips as one finds in the Intermittent Nefūda."

West

East

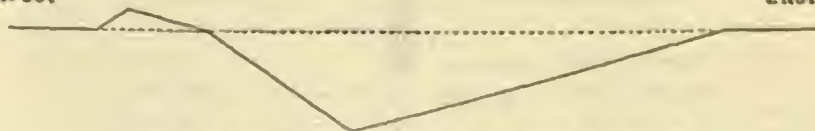


FIG. 20.—SMALL DUNES AT THE STEEP END OF THE FULJES.
(Adapted from W. R. Blunt.)

In one point there is a discrepancy between Mr. Blunt's narrative and my detailed explanation. He makes the east wind dominant, whereas my explanation requires a dominant west wind. Here, however, Mr. Blunt's small dunes at the edge of fuljes come to our assistance (Fig. 20). These are evidently formed by a dominant

east wind, but from the top of the dune to the bottom of the fulj is a *double slope indicating changed wind*. When Mr. Blunt visited the Nefūd the east wind had evidently been operating for some time, but it is easy to see that its work is exactly opposite to what is recorded in the form of the fulj.

There remains the problem, How have the fuljes been *kept open*—as many of them evidently have—through a long period of time? With regard to the keeping open of the corresponding channels in the intermittent Nefūd, the solution is obvious, viz. that the driving power of the wind is increased in the longitudinal valley, so that the distribution of wind-power which originally formed the channels is constantly reproduced so as to keep them open.

In the case of a string of fuljes, however, there appears to be no adequate cause to ensure the permanence of that particular distribution of wind power which produced them. After this admission I anticipate some such criticism as the following: "You have stated that pits in the underlying rock, being places of shelter, would, in the Nefūd, be filled in deeply with sand: are not the fuljes equally places of shelter; and if there is no means to secure the permanence of the original distribution of wind, will not the sand deposit thickly in the fuljes, quickly obliterating their characteristic section and gradually filling them up?" The reply to this criticism is as follows: The two cases are radically different, because *the fulj can move*; the wind can scour away sand from one side while it rolls in sand from the other, and excavate the bottom while it showers in sand at the top. Thus the conditions of permanence of a fulj are almost exactly the conditions of permanence of a dune composed of loose sand throughout (see Sect. II., (3)). Fuljes may fill up slowly in the Nefūd, but it would be almost as unlikely for a very large fulj to disappear as for a very large dune to be destroyed; and, even if the size diminish, the fulj will retain its characteristic shape.

[For an account of square fuljes, see the discussion at end of this paper.]

SECT. V.—THE ACTION OF OBSTACLES.

In the following statement of those tactics of sand which are special to the neighbourhood of obstacles, I rely largely upon observations and experiments with obstacles of a *manageable size* carried out partly by the sea-shore and partly with artificial blast.

Obstacles influence the distribution of sand by wind in two ways: directly, as mere obstructions, and indirectly, by affecting the motions of the air. The weather side of a WALL obstructs flying and rolling sand, but the effect of a wall upon the distribution of blown sand is not confined to this mechanical obstruction, for the wind evokes an eddy on each side (Fig. 21). Now, the eddy on the weather side

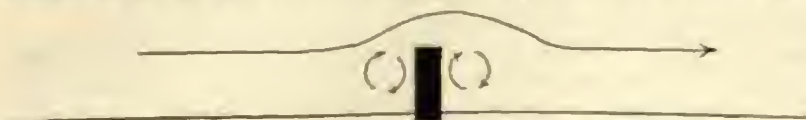


FIG. 21.—EFFECT OF A WALL UPON THE COURSE OF THE WIND.

raises the finer grains, and the eddy on the lee side catches some of these and only tosses away the finest of them. Sand therefore deposits against both sides of the wall. If the sand be of a fine sort, and the wind be strong, the principal deposit is on the lee side; if the sand be coarse, the principal deposit is on the weather side. If the wall be of very great height, nothing will at first get over except dust wafted in the air. In time, however, the mechanical obstruction offered by the wall results in the building up of a sloping platform on the weather side. When

this platform reaches sufficiently near to the top of the wall, the winnowing action above described commences. The deposit on the lee side, being formed by sedimentation, has not the steep slope which characterizes the lee side of a dune. If, however, by favouring conditions, the sloping platform on the windward side should



FIG. 22.—ENCROACHING SAND, EGYPT. DATE PALMS BEING SMOTHERED.

in time grow to surmount the wall, so that the large grains could roll over, a proper dune profile might be produced.

The end of a wall has a similar distribution of eddies, but with their axes vertical, and the deflection of the air horizontal. The end of the wall is kept

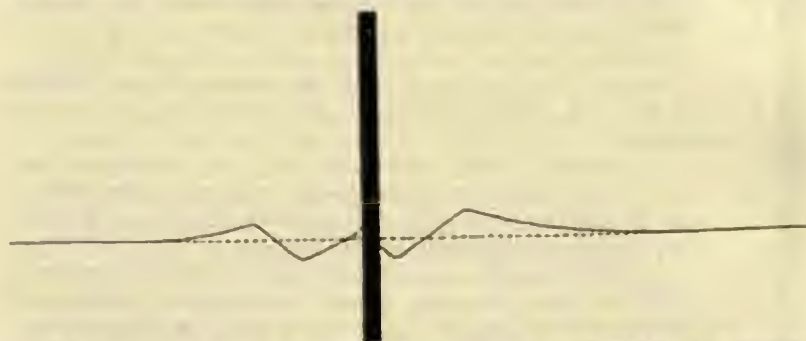


FIG. 23.—EFFECT OF GOUGING AND TOSSING ACTION OF EDDIES NEAR A HARD ELASTIC OBSTACLE (AN APPROXIMATE REPRESENTATION—IN PROFILE).

clear of sand by the scour of the wind. Suppose the wall to be telescoped so that the two ends are close together, forming a post. To leeward of a narrow post the opposing eddies are now brought close together; they gather in sand from opposite sides, and, their motions in a horizontal plane being equal and opposite, and the post

being high, the drift of the rolling and flying sand is stopped,* and behind the post is deposited a ridge of sand which tapers and slopes to leeward. A deposit is also formed on the weather side, the coarsest flying sand bursting through the eddy. If the post be supported as a rail, the same action of eddies takes place, and the flying sand is brought down in a steeply falling quiet shower. A close combination of posts and rails makes *scuttling*, which offers less obstruction than a wall, but, by bringing the eddies into contact, prevents that effective co-operation in winnowing action which helps to keep sand flying past a wall. The action of posts is that of tree-trunks, stems of reeds, and blades of grass, and the action of wattling mimics that of tangled bushes and leafy boughs (Fig. 22).

Sand-shower in a falling wind may completely cover any projection and fill up hollows, just as happens in a quiet fall of snow, the contour of the mantle of snow being smoother than that of the country which it covers. Sand-shower, however, usually comes like *driving* snow, and then an enormous quantity of flying sand must be brought before a hard elastic obstacle can be completely buried. This is due to the gouging and tossing action of the eddies, which clears away all but the coarsest grains in the manner indicated by Fig. 23. The gouging action appears to be stronger on the weather side, where the pressure of the air is greater. The same figure illustrates—the formation of stationary dunes at a little distance from hills or other obstacles, and also the practicability of meeting permanent landmarks in the desert. It would also appear to indicate that ancient pyramids, monoliths, colossi, etc., in a desert plain should always be partly covered, but seldom buried in sand. The following passage from Dr. Sven Hedin's recent paper on the Takla-Makan desert bears upon these tactics. He says, "The formation of the mounds near the stem of the *tograk* is very changeable. Sometimes the mounds seem to leave the *tograk* alone and to go round it, and sometimes the tree is wholly embedded in sand, only the branches being visible." Dr. Sven Hedin goes on to say, "I suppose that this is due to the fact that the *tograk*, being entirely dependent on the water in the ground, grows in small hollows invisible to the eye where the water is nearest." It seems to me that the two cases are explained by the different effects of an obstacle according as the wind or the sand has the mastery.

The tactics of sand in transverse valleys may be deduced from what has been said of the action of walls. The case is illustrated by Fig. 24. The way in which the drifting power of the wind is increased in a longitudinal valley scarcely needs illustration.

In saucer-shaped depressions it is probable that winnowing proceeds actively at first, the upward spring of the air from a hard elastic bottom tending to keep the saucer free of sand. As soon, however, as the gradual accumulation of the coarsest grains has provided a soft bed, the process of filling up should proceed more rapidly.

FIG. 24.—DEPOSIT OF BLOWN SAND IN A TRANSVERSE VALLEY.
(After G. Salway.)

* The motion of the sand is not the same as the motion of the air in these eddies, even in the horizontal plane, owing to inertia. The mode of operation of posts or rails may be called *cheating* the wind.

A cliff facing the wind deflects the current of air, which rises in a billow above the edge of the cliff. Below the billow is an eddy, which assists in bringing down sand borne by the wind. Thus a cliff may be capped with blown sand, which deposits in a position apparently exposed, but in reality well sheltered.

In order to appreciate the effects of obstacles in checking the encroachments of blown sand, it is necessary to discriminate between the *travel* of dunes and the *leeward spreading* of a dune tract.

The velocity of a dune is the rate of advance of the crest of the ridge, which takes place by accumulation of sand upon the steep lee slope. The supply is brought in two ways, viz. by the rolling of coarse sand-grains over the crest,



FIG. 25.—UPPER PART MOVING DUNE; LOWER PART FIXED DUNE (EGYPT).

and by the deposit of such part of the flying sand caught by the eddy as is not tossed away again. The permanent part of the accumulation on the lee face is the coarse sand which rolls over the crest, for the finer sand brought back by the eddy is fanned away, when, by the rolling motion of the dune, it is once more brought to the weather side. If the strength of the wind be doubled, and the amount of sand drifted up to the crest be also doubled, it does not follow that the velocity of the dune will be doubled, for several sizes of sand which before would have rolled down the lee slope will now be whirled away from the smoking crest. Only in the case of an old dune containing scarcely any fine sand, and upon which a wind bearing but little sand blows, must the velocity be nearly proportional to the strength of the wind. Otherwise the increase of wind may increase the rate at which new dunes are made to leeward, rather than the rate of travel of an individual dune. In this matter considerable difference must be expected between those desert dunes, in which much grinding and pulverizing is going on, and coast dunes, in which the wind deals with a prepared material.

The stage which has been reached in the winnowing and grinding process, as it greatly influences the manner of encroachment of blown sand, so is it of importance in determining the kinds of obstacle which will in any particular case best

resist such encroachment. An old travelling dune, consisting almost entirely of fairly coarse sand, is effectually stopped by the running water of even a narrow stream. On the other hand, it is by the rolling motion of such dunes that prominent obstacles are most readily submerged, emerging, however, as the dune rolls on.

It follows, from what has been stated above, that the most general means of checking the encroachments of blown sand is to promote the growth of dunes. Binding the surface stops the rolling of the dune, but does not prevent the travel of fresh supplies of sand and the accompanying formation of new dunes to the leeward. On the other hand, *wattle fencing and posts* • (or *faggots*) may be employed, so as to check the rolling sand, and bring down the flying sand in a thick, quiet shower. This not only hinders the formation of new dunes to leeward, but also builds up a great dune which is practically stationary. Any device for checking the encroachment of blown sand should be capable of adjustment to change of level. This advantage is possessed by posts, which can easily be raised when they have been nearly buried; but *vegetation* has the following advantages, to mention only those which are of a mechanical nature, over artificial appliances. First, vegetation adjusts itself to a rising level; second, a spreading root binds the surface, while stem, branches, and foliage arrest the flying sand; third, the old roots help to consolidate the dune (Fig. 25).

The reclamation of tracts of blown sand is a practical art destined to be of immense importance. For the development of the art, a knowledge of sand tactics is essential, but not in itself sufficient. Other factors come into play which cannot be dealt with in the present paper.

I desire to acknowledge the kind help which I have received in the library and the map-room of the Royal Geographical Society. Especially my thanks are due to Dr. H. R. Mill for the supply of references, and for much valuable criticism. The two plates are from photographs sent me from Egypt by my friend, Mr. E. A. Floyer, F.R.S.

After the reading of the paper, the following discussion took place:—

Prof. BONNEY: I should like some one to be called upon to speak first who really knows more about the matter than I do, for my chances have not led me into regions of extensive sand. I have no knowledge, and therefore cannot venture to criticize this very elaborate and, it seems to me, admirable paper. I will only say one word, because I am quite sure that we rather overlook the importance of the wind as a geological agent, though in denudation I do not suppose it often produces very important effects. There are certain special circumstances where, no doubt, as in some great deserts, it is effective in gradually breaking up the surface, and particularly in bombarding it with the grains of sand, but instances of that are common enough in text-books. As a transporting agent it must be extremely important; and then we come to the question whether, in examining ancient rocks, we can identify this wind action, and that certainly seems to be true, because the rounding of a grain of quartz (which is the common material of which sand is composed) in a river takes an immense time. According to Daubrée's experiments, a grain of sand would have to travel 3000 miles before being effectually rounded; so in the ordinary river-bed you will find few rounded grains. You will find them on the seashore, but even there they are not so very numerous. If, then, you find you get a very great predominance of well-rolled grains, you may expect they were manufactured under wind conditions. Now, we do get rocks made up of

* See Lieut.-Colonel F. Bailey's "Forest Tour among the Dunes of Gascony," *Transactions of the Scottish Agricultural Society*, vol. xi. pt. III, 1857.

extremely well-rolled grains. The oldest I have come across were in Ullarnwood Forest rocks, a little older than the Cambrian period. There, in a bed of slaty rock, we get thin streaks of sandstone which are almost entirely made up of perfectly well-rolled grains. This region must have been like a desert, where the wind had considerable action on broken-up sandstone, and brought in sand among the ordinary fine sediment. Then, again, I find some rounded sandstone in the upper part of the Old Red Sandstone in the island of Arran, in Scotland. Every one knows the millet-seed sandstone in the north-west of England; that also has probably received its rolling from desert action.

Prof. HULL: I have listened to this paper, so far as I understand it, with interest, but I confess it wants much more study than I have been able to devote to it. I would not take part in this discussion if it were not that I have to some small extent that advantage which Prof. Bonney alluded to. I have been in countries where there are sand-dunes of considerable size, and I will allude to two of them. One is the western shores of the Holy Land, and a district extending almost from the borders of Egypt, with great sandhills in the neighbourhood of Alexandria, only cut through by the Nile. It continues all along the shores of the Mediterranean, at any rate, as far north as Beirut. I confess that, after having seen the many sandhills in our own country, I was astonished at the magnitude of these great ramparts of sand raised up on the shores of Palestine, where they encroach on the land. As a matter of fact, these sand-dunes are invaders far more than the waves of the sea, and it is lamentable to see the extent of the ravages of this ever-advancing movable mass of sand on some of the most fertile tracts of Philistia. One point I can confirm from my own observation—that a small stream will stop the advance of this invader. A few miles to the north of Gaza there is a small stream coming down from the interior, running into the sea, and along its banks for a mile or two where we followed it, the great mounds of sand are absolutely brought to a standstill; the reason being that the stream carries away the particles of sand as they are deposited into the sea. Ancient Gaza is considered to have been buried beneath the sandhills which rise to the west of the modern city.

I may mention that the heights of some of these sand-dunes have been determined by the Ordnance Survey, and they rise to about 200 feet above the level of the Mediterranean. They are sometimes 4 miles in diameter, and in one part between Gaza and Jaffa they are about 7 miles in continuous length. While it is a great puzzle to me to know where this sand came from originally, I think in almost every case we can trace the origin to some local cause, and I came to the conclusion that these sandhills originally had their source in the breaking-up of the calcareous sandstone of Philistia.

Another desert that seems to tell the same story is the well-known Sahara where the sandhills have attracted a great deal of attention, especially from Professor Zittel, who has endeavoured to account for the region by the erosion of the Nubian sandstone. The Nubian sandstone crops out in a fine range of hills to the south of the Sahara, and the prevalent winds coming from the south and blowing to the north have carried the sand derived from atmospheric erosion and spread it over the desert. It has constantly been creeping on from the south, and though doubtless this desert has been a bed of the sea, still the source of the sand-dunes is probably the Nubian sandstone.

Mr. WHITAKER: I cannot say that I have been in the desert, but I have been by the sea-waves and seen the sand that blows. It is, however, strange that this little island contains a tolerably fair epitome of geological formations, and we have in England even our minute deserts. In working at the geological survey in

Suffolk, I have seen sand blown inland as well as on the coast, having come across a ridge of sand which I had very little hesitation in pronouncing blown sand, from its shape and appearance. If Mr. Cornish is ever near Brendon and Thetford, I hope he will look at the sand there. If he could blow it into dunes and get it isolated, he would confer a great favour on most geologists. As a matter of fact, just a few inches of sand lead to great conjecture as to what is underneath. I have seen the sand rising up in great spouts there.

As Prof. Bonney rightly said, we would infer blown sand from finding the sand in well-rounded grains; but there are cases where it would be hardly fair to expect such rounding, for where loose sand is in tolerable profusion, you can get blown sand without much attention, as in some of the English examples spoken of. Of course, in those cases where sandy beds are exposed to the wind in fairly open country without shelter, the sand is blown about. I was told that in one case, when a lot of labour was unemployed, a landowner had the idea of covering the ground more or less with large belts of trees for ornament; he did so, checked the wind, and stopped the blowing about of the sand. There is a description of the sand flood in Suffolk in one of the early numbers of the *Philosophical Transactions*. Mr. Cornish has spoken about the shell-sand on the Cornish coast. Now, I should like Mr. Cornish to note, as he goes on—I suppose he will—the different compositions or qualities of the different sands, because it is possible that the shell-sands would hardly wear to rounded particles in the same way as other sand.

In noticing sand, I have been struck by the extremely beautiful forms sand, like drifted snow, takes. I don't know if this has been investigated mathematically, but I should like, if it could be done, some investigation made into the curve taken by wind-driven materials—light snow or heavy sand. I think Mr. Cornish made a great point when he showed how different actions will take place with light sand not previously blown and sand from which the lighter particles have previously been blown.

Prof. Bonney stated that a grain of sand required 3000 miles of travel to become rounded. [Prof. BONNEY: I said Daubrée stated it.] I don't know whether this refers to sand under water. Of course, sand not under the water would not have to travel so far, and there is probably far greater friction among the particles. One hundred miles of travelling with the wind would have as great an effect, I should think, as 3000 miles under water. I am glad to find, among other things, that this paper is not to be an isolated one, but one of a series, and also to see that the author says how difficult it is to know where sand begins and pebbles end.

I am glad, too, that he has kept in view the wave-action in water, because there is no doubt the action is much the same. It is a rather bad thing very often to divorce solid from liquid. I remember a case at Southampton, where people stored loose grain in the top floor of a granary. They did not count on its acting as a liquid. It found the weakest point in the floor, poured out on to some stairs, and very properly landed itself on the floor of the Corn Exchange.

Prof. SHELLEY: There is very little that I can add to the remarks which have been made. I have had the pleasure of seeing some removal of sand-dunes on the coast of Norfolk. They formerly extended, as is well known from the figures given by the late Sir Charles Lyall, in a ridge of sandhills, which I visited in 1861. In 1863, when I again went over the country, the ridge had entirely disappeared, after lasting very nearly two hundred years. This is an element in the history of sand-dunes which is extremely interesting, because it shows that the process of accumulation depends upon extremely varied circumstances and unbroken continuity of action. You may have the whole process reversed, just as, on the smaller scale, you get the process of shaping a sandhill reversed, so as to modify its whole form.

The examples I have studied most carefully are those round the coast of Holland, where you have very much better examples for examination than anywhere I know in this country. One very striking feature of such dunes is that the land side is totally different from the sea side. The side towards the sea is particularly well rounded in a series of slopes; the sides towards the land are constantly concave, and the forms of the hills are concave. The slope varied according to the blowing of the sand from the sea, and the change of direction of the wind from time to time.

One element in the formation of these sandhills is the temperature of the slope of the sand which is furthest removed from the sun, because the chilling influence of that upon the air creates a downward current, which causes a deposit of the sand, and leads to a movement of sand which tends to the inward flow of the sand-dunes.

One of the most interesting series of sandhill movements I remember was published by this Society in its journal about fifteen to twenty years ago—"The Passage of Sandhills across the Desert of Gobi," and the forms there described are identical with some of those brought before us by the author to-day. The details of sandhill movement may be certainly seen on a small scale in the neighbourhood of Westleton Heath, that probably Mr. Whitaker was alluding to in Suffolk. I myself have seen exactly the same class of phenomena, on a small scale, in Holland, and in the south of Africa, on the southern slope of the New Veldt range, where there is a phenomenon of a striking kind. The shales become broken up by the action of the sun, and divided into extremely fine particles which are moved by the wind; the wind sweeps them onward so as to cover the entire surface of the country for miles with an appearance that can only be compared to the rippling of sand on the seashore. You see it many miles off, and as you come near its character is manifest; but under no circumstances have I seen this rippling take the form of sandhills in that part of South Africa.

LORD BELHAVEN: I thought I might make one remark about the sandhills of Bermuda. Bermuda, as the meeting is no doubt aware, is composed of coralline sand, which has been blown upon the southern portion of the coral-bank into a line of hills in the form of a horseshoe. I have had the opportunity, when excavating the soft Bermuda stone, to see the way in which the sand is lifted and deposited, very rarely in any prevailing direction. The stratification is extremely mixed; within a short distance you may come across one stratum rising to the north, then another rising to the south, and another to the east, and another to the west. These, by the action of the rain passing through, have formed into a light concrete; but you see how the different strata were formed in early days, and are now solidified into hills.

MR. J. F. BLAKE: I have listened to this paper with much interest, because I have been considering the sand phenomena in Cutch, in connection with the dunes which the author mentioned. He has drawn attention to the longitudinal form of dunes. They require a certain amount of explanation, and reading through this paper carefully, I was happy to find I agreed entirely with the explanation the author gave, which is the same as Dr. Blandford's. The longitudinal dunes owe their origin to a greater velocity of the wind than is ordinarily available. In a way beautifully shown in detail by the author. I should like to get a few more details about the amount and velocity of the wind, i.e. what is the amount and velocity of wind necessary to produce longitudinal dunes, in relation to the size of the sand-grains? because it would be satisfactory to have that cleared up. As a matter of fact, the average rate in Cutch would be about 30 miles an hour. Are sandhills, of a height of 400 to 500 feet, raised entirely without underlying

rock? The question was raised by having to account for some very remarkable deposits of sand at a height of 700 feet in Cutch, which I have referred to the action of blown sand. I am writing a paper on the subject for the Geological Society to-morrow fortnight. Of course, to get the sand up to this height demands a considerable force of wind even in a longitudinal valley, where it would be increased. Still, we had a wind of 30 to 40 miles an hour constantly.

There are one or two points I want to ask about, although in most cases I agree with the author. He says, "One of the most remarkable phenomena attending the distribution of earthy materials by wind or water is the sorting action exercised by the fluid." Now, if I had been writing that sentence, I should have said the non-sorting action of the fluid, that is to say, that large and small particles are in definite relation to the wind. Different winds, that come at different times, land different-sized particles; by water you get small particles in one place, and large particles in another.

A little further on he adds, that the action of wind in the deserts tends to lower the general level. That is, of course, if the sand is derived from the desert itself; but if brought by the wind on to the desert itself, it may raise, and probably will raise, the level.

I would like to say a word about these *fuljes*, as the author has laid considerable stress on them. These little ripples he has noticed are very minute, and only observable by the careful eye; but these *fuljes* are described as sometimes 280 feet in depth. Now, I think it would take a strong current to hollow out 280 feet from a mass of sand. I have sometimes dug a hole in the sand to see what would happen, and have always found that the wind fills the hole up from the windward side, and does not excavate on the other side to any extent worth mentioning; it does not move onward. Do these *fuljes* move onward? If so, this theory is correct; but if it is not so, it can hardly be correct.

One further point I am glad to see noticed in diagram 23, viz. the action of sand near a hard elastic obstacle—one of the phenomena of sand-dunes, the dip of which, on the side towards the obstacle, is a very marked feature. As he says, any obstacle you may put up is always separated by a hollow from the sand-dunes. The stratification of the interior of the hollow is very much like the stratification of ashes round the center of a large volcano. I should like to ask the author also whether he has ascertained, or will ascertain, if there is any relation between the motion of a sand-glacier and the average velocity of the prevailing winds; also, whether he can determine, from the shape of the dunes, the direction of the prevailing winds of a district. It might be interesting to find out the prevailing direction of wind when meteorological observations could not be made on the spot.

I must add that I am delighted with Mr. Cornish's paper.

Captain A. H. McMANUS: I should like to say a few words, although I did not come prepared to speak. In my recent wanderings in the deserts between India and Persia, I have travelled upwards of 1000 miles of sandhills, and have observed sandhills under various conditions. I saw every kind mentioned by Mr. Cornish. First of all, on the level plains we had examples of primary sandhills, which he calls "*barchanes*," which may have been primarily caused by an obstacle. We found these *barchanes* only on flat level plains, and invariably in the shape of a horseshoe, with a gradual slope on the windward side, and a hollow with a steep slope on the lee side. I have watched the action of the wind during a storm on these *barchanes*, and also on the "*fuljes*," of which we saw every kind and variety, both of horseshoe shape and square shape. These latter we found in the higher sandhills, generally where the sand-dunes were eating up a mountain range. In some cases we found mountains altogether covered up by sand. Others had sand

tanked up against their sides as high as 1000 to 2000 feet above the level of their base. These sandhills, or sand-mountains as many of them should be called, were of every form and shape, among which were all the various shapes described in Mr. Cornish's paper. We found fuljes all over these higher slopes, more especially in places where the wind-swept sand had formed high valleys between mountain ranges. We found, as I said, fuljes also of a square shape. I remember a series of these in a high sand valley near Amir Chah. They must have been from 100 to 200 feet deep in the centre.

Mr. CORNISH: Had they two slopes, steep and gentle?

Captain McMAHON: The square fuljes were formed by two high parallel ridges of sand, with the hollow between them cut into squares by crossbars of sand. As far as I remember, there were not two slopes, a steep slope and a gentle slope, as was the case in curved fuljes. All four sides had the same slope. There were in places more than two parallel ridges of sand, and therefore larger series of square fuljes. I had the opportunity, on more occasions than I cared for, of watching sandstorms, and I have watched their action on both fuljes and barchanes. I have sat on the edge of a barchane, and seen the wind sweep off the sand from the top, while in the hollow on the lee side beneath the current of sand blowing off the top, I used to see an eddy of wind sweeping the sand on the slopes of the hollow in a curved current more or less at right angles to the upper current. When the wind stopped, you could then clearly see that the sand-ripples on the windward slopes were at right angles to the direction of the wind, while those in the hollow on the lee side were parallel to the direction of the wind. The same action took place in the fuljes; but whether the scooping action of the lower eddy of wind is what originally caused the fulje, or whether it only explains how the hollows are kept empty of sand, I cannot say.

The PRESIDENT: I should like to ask Mr. Cornish what is the plan of the barchanes, or, as we call them, *medanés*, and whether they form themselves in regular lines (he mentioned stripes), or whether they are formed accidentally by some obstacle which has obstructed the movement of the sand. I have seen a good many of them when wandering about in Peruvian deserts, after losing my way, and should have noticed any regular lines. I saw them scattered in various directions, and therefore came to the conclusion that they were formed by some such obstacles as a dead mule or a stone, where the sand stopped and gradually formed into these horseshoe forms. If this is the case, it is not necessary to come to the conclusion that they are formed by the fall of the heavier grains first, in which case they would be in regular order according to the strength of the wind. A point of great practical importance is the devising of a method of stopping the sand and making the dunes permanent. I fancy in Holland this is done by planting strong grass called *helm*. I noticed in one of the northern deserts of Peru, where the *medanés*, or barchanes, are of white sand, there were small patches of apparently whiter sand on the top, and I was told that these were caused by innumerable spikes of *amaranthus* plants, which keep pushing up their spikes to get above the sand. These had the effect of stopping them, and I am told that in parts of the desert of Peru they may be considered as almost permanent, and are seldom moved.

I should like also to know if Captain McMahon heard the curious musical sound among the sand-dunes in the early morning.

Captain McMahon: There is such a desert just north of the Helmand where there is said to be a curious sound made by certain sandhills.

The PRESIDENT: I think I remember, in his book on the 'Source of the Oxus,' that Wood made a long journey in order to visit some barchanes emitting musical sounds.

Captain McMAHON: Sir R. Pellock's party visited one of these sound-giving sandhills.

The PRESIDENT: And similar phenomena are mentioned in the Gobi desert? I think we ought to congratulate Mr. Cornish, for it must have been very agreeable to him to have made observations on the sea-coast of Cornwall which afterwards explained these phenomena, called *fuljes*, on a larger scale in the deserts of Arabia. Probably he would like to answer some of the questions.

Mr. CORNISH: In reply to Mr. Whitaker's question as to curves formed by sand in the neighbourhood of obstacles, these are very interesting and beautiful, and I should like to show figures of them to Mr. Whitaker, if he will afford me an opportunity of doing so. I have not yet had an opportunity of examining snow-drifts properly, but I hope to take, as soon as possible, an opportunity of examining its tactics.*

The quantitative data for which Mr. Blake asks are, unfortunately, not at present available. Such data, if combined with my plan of treating sand-dunes as waves, would, I think, render the tactics of blown sand susceptible of mathematical treatment.

With regard to the sorting of sand, that process goes on perfectly in ripples. In the dune you get everything mixed up, because it registers the impress of many changing winds; there is nothing definite until you examine it in the light of the phenomena of ripples. The time taken in the formation of dunes is too great for observations.

As to whether *fuljes* move, if you get them sufficiently large you will never be able to watch their movements. These places in Arabia have only been visited from time to time. It would take a very big storm to shift it a foot; there is no one to tell you whether it has shifted a foot or not. But I don't demand that the winds in Arabia shall be so strong as to dig out holes 250 feet deep in the sand. I think a merit of my explanation is that it does not demand that the wind should dig these things out, but only keep them open; that does not demand quite so much violence of wind as would be required to dig a hole and gouge it out to the bottom.

I have been waiting for an opportunity of comparing a volcanic cone with dunes, but my opportunity has not yet arrived. The inside of the crater, if composed of scree material, corresponds to the lee side of the dune; the other side corresponds roughly, at any rate, to the windward side of the dune, so that one would expect a sloping side and a steep side. This is very similar to the form shown in Fig. 23.

I should say dunes certainly show the direction of the prevailing wind. I don't think there would be much difficulty in telling the direction of the prevailing wind in a sand-dune tract. You can make it out from loose sand that is not fixed by vegetation.

The observations of Captain McMahon are extremely interesting. I think I have worked out the horseshoe form of *fuljes*, and I shall be glad if he can give me more information in regard to the square form.† The barchanes, I believe,

* Some slight observations, which I have since made, show curious differences between the tactics of drifting snow and those of blown sand.—V. C.

† I am able to explain these square holes from the further description which Captain McMahon has kindly given me. They occurred in a mountain pass where the wind was focussed, and the sand-supply was concentrated to an even greater extent. The first action was, evidently, the laying down of longitudinal dunes. Afterwards, when the pass was thus partly blocked, the transverse dunes formed across, making a grid pattern with the cross-bars lower than the longitudinal bars. It is easy to see

dot the desert plain without any order, sometimes, I think, one behind the other at various distances, but generally with no particular arrangement. Of course, this suggests the idea that there must have been something there to stop the sand, but it is noticeable that people are seldom able to produce these obstacles or see them.

It is extremely difficult to cover up a hard elastic obstacle. Mr. Palgrave relates how a few camel-loads of stones were put down in the eastern part of the Nefud of Arabia, and two or three years afterwards this small heap of stones still stood out in a land of shifting sandhills. A hard elastic obstacle of that kind will scour the sand away, even as in seas and rivers, where around rocks, instead of accumulation, you get erosion. I think the barchane may be easily deposited without the intervention of an obstacle. The heterogeneity which I referred to is heterogeneity of wind—illustrated by the observations made at Hayle. The sand would drop as a whole, and would form a nucleus which would speedily grow.

Captain McMANOX: One very important point about the barchanes was that we only found them on hard level plains, not in soft sand plains. I came to the conclusion that they were first started by sand being blown up against some obstacle. The plains we found barchanes in were hard plains of black gravel, and we used there to find barchanes in numbers all over the place, not in lines one behind another or in any regular order, but in groups of irregular shapes. One particular lot were noticed by Sir Charles MacGregor in 1877, and he particularly described them in his 'Wanderings in Beluchistan.' I examined these nineteen years afterwards, and they answered his description to a T, and that shows that they do not change position rapidly.

Mr. CORNISH: You think they are formed by obstacles on hard level plains, and are never found on the soft sand; then I must hedge to this extent—I think my observations show that barchanes can be formed without a nucleus of any kind, but it may happen that the sand depositing round a bush, whose branches beat the wind, may be shaped by the wind into barchane form.

The PRESIDENT: With regard to the prevailing wind, I may say that throughout the deserts of Peru the cusps of the *medinos* all bend in exactly the same direction.

We have had a very interesting and suggestive paper, for which we have to thank Mr. Cornish. As he is continuing his researches, I trust before long it may be repeated, and we may have a second such paper. We have had an unusually exhaustive and interesting discussion, and I am sure the meeting will pass a hearty vote of thanks to Mr. Cornish for his paper.

ANCIENT TRADING CENTRES OF THE PERSIAN GULF.

III. PRE-MOHAMMEDAN SETTLEMENTS.

Its point of time, after Siráf and Kais, follows the important and interesting city and state of Hormuz, on which I have written formerly. I propose, in this paper, to take a general view of the earliest commerce, and give a description of some of the most ancient coast settlements in the Persian Gulf. Their history is little

how, if the accumulation of sand proceed, the final stage of this formation would be rows of rectangular pits in a plateau of deep sand. The formation of bars between stripes occurs also in the sand of tidal rivers where, as Prof. Osborne Reynolds has pointed out, the channels between the well-known longitudinal shoals are laid down in transverse ridge and furrow by the rippling action of the tide.—V. C.

known, and they may almost be called pre-historic, as the early history of Persia is extremely vague, and dates can only be occasionally assigned by reference to events recorded also in Greek or other history.

Considering the comparatively easy coasting navigation by the gulf route, it appears (as might be expected) to have long preceded the Red Sea as the channel of communication with the East, and it may well be that the early ascendancy of Babylon and Nineveh arose from this circumstance, and that, later, the adoption of the Red Sea route by the Romans led to the wealth and importance of Alexandria.

Gibbon suggests that sea communication was initiated in consequence of the overland caravan route through Central Asia being closed by disturbances, and refers it to the time of the outbreak of the Huns in the first or second century of our era. It is, I suggest, more probable that it was long anterior to that period, and that Dean Vincent's conclusion is nearer the fact, when he states that the communication with the East is the oldest in the world, and older than Moses or Abraham. Dr. Heeren* observes that we can entertain no doubt of a considerable navigation of the Persian Gulf, not, however, limited to that sea, but extending to large and distant countries, before the age of the Persian empire.

We have a suggestion of navigation in the earliest times, in the myth † (preserved by Herodotus) of Oannes (Hea), the fish god, who came up from that part of the Erythraean sea which borders on Babylonia, to teach the inhabitants of that country letters and sciences and arts of every kind. This seems to indicate the arrival, in ships, of strangers of a higher grade of civilization, who came to be regarded as supernatural beings, as was also the case with the discoverers of America. Where these strangers came from can only be matter of conjecture—it might have been even from China—but Sir H. Rawlinson considers they were a dark race not belonging to the Semitic family.

Rawlinson also suggests that the Phœnicians may have originally come from the Bahrein islands, and extended westward to their settlements on the Mediterranean littoral at least five thousand years ago. There is, he considers, no direct evidence of this connection. On these islands tumuli and other remains of probably Phœnician origin have been lately discovered and described by Mr. Bent. Other tumuli, ‡ of Babylonian age, with a cuneiform inscription, were discovered by Captain Durand on these islands. They have been identified with the Tylus and Aradus of Ptolemy and Strabo. The latter authority states, however, that they are two islands, with temples resembling those of the Phœnicians, and that they are ten days' sail from Tereodon (near the mouth of the Tigris), and one only from the entrance of the gulf at Macm (or Musandam). If this be so, they would have to be placed among the islands near the entrance of the gulf, where, however, no such ancient remains have been observed. Ptolemy also places them near the island of Vorocetha, which is, doubtless, that now known as Kesm or Kishm, and formerly called Brockt; and he further places them near the Anaborum promontorium and Armuza, or old Hormuz, on the main land. The Anaborum promontory is certainly Musandam. Strabo also says the Phœnicians had a settlement called Sidon, or Sidedone, visited by Nearchus, and this has been located near Ras Yarid.§ He also states that from these places they moved to establish themselves on the Mediterranean, transferring the old names to the new settlements.

* 'Hist. Researches into the Trade, etc., of Antiquity.' Translated by D. A. Talboys.

1833.

† Sir H. Rawlinson on "The Islands of Bahrein," *Roy. Asiat. Soc. Jour.* for 1880,

p. 202.

‡ Described in the *Roy. Asiat. Soc. Jour.* for 1880, p. 189.

§ On the Persian coast, not far from Kishm island.

Strabo's information about the Persian Gulf was admittedly taken from Eratosthenes, who again was chiefly dependent on the narrative of Nearchus and his companions. The extent of the very early voyages is a matter of speculation, it is probable it may not have extended beyond Ceylon. From the records of Fa-hian* of the fourth century, it is clear that ships from China came as far as Ceylon, and there exchanged merchandize with the Arab vessels, and this is confirmed by the account of Cosmas,† who wrote between 530 and 550 A.D.

GERRHA.—Of this ancient emporium on the Arab coast, which flourished from very early times until after our era, the very site is disputed. The Rev. C. Forster‡ supposes it to have stood at the south end of the deep bay south of Bahrein, where ruins were reported by the first surveyors of the gulf; but no account has been given of these, nor is it certain they were visited. It is more probable the site was near the present town of al-Katif, on the main land opposite the north end of Bahrein. Captain Durand (*op. cit.*) mentions ruins still retaining the name of Geroyeh near this place, but they have not been explored. Rawlinson is of opinion Gerrha represents the Ophir of the Bible. This part of the sea presents an interesting field for archaeological research; the time at our disposal during the survey was very limited, and fully occupied with the necessary observations.

Strabo states that it stood in a deep gulf, belonging to Chaldean exiles from Babylon, 200 stadia from the sea, and 2400 from either Terebon or Icarus Island (probably Failakab)—it is not quite clear which. Heeren (*op. cit.*) supposes it was founded as a depôt by Chaldeans, and that its most flourishing period was after the destruction of the Babylonian commerce by the Persians. He refers to it as the one city on the Arab coast, and as probably near al-Katif.

BAHREIN.—These islands are referred to in many old writers of Mohammedan times, as the centre of the celebrated pearl fisheries. Of earlier times, Colonel Taylor§ says that the earliest inhabitants are asserted by some to have been ancient Persians, who, after long residence, adopted the language of the nearest coast; but by others they are said to be descended from the Arab tribe of Thamud (1900 B.C.), who were driven out of Yemen and migrated into Awal (or Bahrein). In A.D. 429 the idolaters still held the islands, but in 615 Babraun, of the Sassanian dynasty of Persian kings, possessed himself of it, and nominated a governor, who retained the country till the Mohammedan era, when the government reverted to the original people. This account, which does not quote any authorities, does not refer to its subjection either to Kais or Hormuz. Of its later history I hope to write hereafter.

Terebon, called by the Greeks Diridotis, appears to have been the great Babylonian port; it is referred to by Ptolemy, who places it on a delta between an eastern and western mouth of the Tigris (or rather Shat-al-Arab). Deau Vincent assigns it a position on the Khor Abdallah; but it seems more probable it stood near the old town of Zohair, which lies southward of Basrah, on a channel, said to be artificial, leading into the Khor Abdallah, and probably once connected with the river. It is, I believe, first mentioned as the port at which Nearchus first touched at the end of his adventurous voyage, and is described as a mart, the centre of the commerce of Arabia.

* 'Voyages anciens et modernes.' E. Charton. Paris: 1854.

† 'Cosmas Indicopleustes. Relation de divers voyages.' Thérinot: 1891.

‡ 'Hist. Geogr. of Arabia.' 1814.

§ 'Selections from the Records of the Bombay Government,' No. xxiv., dated 1856. Brief notes, etc., prepared in 1818 by Captain R. Taylor, Assist. Pol. Agent in Turkish-Arabia.

In 'Ancient Fragments' * Cory says that Megasthenes, quoting from Abydenus, records that Nabuccodonosar built the city of Teredon to check the incursions of the Arabs. I do not know that any mounds or ruins have been identified as the site of this place; but the country outside Basrah and far to the southward is full of remains of ancient irrigation canals, and of mounds, which deserve further investigation.

According to Dean Vincent, Teredon declined after the Macedonian conquest, and was superseded by Obollah, called by the Greeks Apologus, probably under the Arsacides. Strabo refers to Apologus at the head of the gulf, but does not mention Teredon. Obollah was in its turn superseded by Basrah, which was founded about A.D. 636 under the Kaliphate of Omar. Of Obollah some memory is preserved in the name attached to a canal on the right bank of the river below Basrah, and nearly opposite the Hafar river or canal. This is mentioned by Abulfeda (A.D. 1274-1331).

GANĀWĀH.—This is another of the forgotten maritime cities. The present village is about half a mile from the sea, about 35 geographical miles northward from Abu-shahar (Bushire); the only feature it possesses is a picturesque tomb or mosque with a spire, of considerable antiquity. Inland of the village the ground for upwards of a mile is covered with mounds, the remains of an ancient city, so completely fallen to ruin as to leave no masonry standing. About a mile inland from the village is a large river or watercourse, generally nearly dry, which has a channel about 80 yards wide among the mounds, with steep clay banks, its bed being 10 to 15 feet below the surface-level. It runs to southward and then to westward, entering the sea about a mile and a half below Ganāwah, and is now called Khor Khalil. It is tidal near its mouth, and some coasting trade is still carried on by small boats. Among the mounds we came across two walls, circular, about two feet in diameter and 20 feet deep; they were coated inside smoothly with fine lime or gypsum, and in good preservation, having been, we were told, then recently discovered. In the sections of ground exposed by the action of the watercourse are seen the walls of ancient buildings, sometimes projecting, somewhat below the present surface-level; detached shapeless masses of masonry also stand, or lie overturned, in the bed of the torrent. The masonry is good, the cement being better preserved than the stones. In many places burnt bricks have been used. Sections of floors of the houses are seen as horizontal lines about 6 feet below the surface, consisting of a concrete of lime and broken stone. We could not hear of any inscriptions or coins having been found, and, although the mounds are strewn with fragments of coarse local pottery, I could not find any china. The only curious works of art were circular discs of baked clay, with a groove round the circumference, which were plentiful, and, we were assured by the people of the place, were intended for alingstones. I cannot suggest any other use for them. Some of these were sent to the Asiatic Society of Bombay. They were rather large; I should estimate, 6 inches in diameter.

The notices of this place are few, and throw little light on its history. Sir Henry Rawlinson † states that under the Achæmenians the port of Dalaku, the capital, was at the mouth of the Grania. It is possibly the Taos of Ptolemy, on the Rhogomanes river, which is shown on his map as rising near Persepolis. The *Periplus* has Taos on the river Granis. I can find nothing about its commerce; but, from the size of the little river and absence of any porcelain fragments in the mounds, surmise it was local only, and not with the far East. In Abulfeda's

* By Isaac P. Cory, 1832.

† Vol. I, *R.G.S. Proceedings*, 1855-57.

geography* it is mentioned that Jannabah (doubtless Ganawah) is one of the ports of Fars, "almost entirely ruined." The Sinis of Yakut, "to-day in ruins," must, I think, be sought at Khor Sinl, further to the northward, where ruins are stated to exist, but which I have not visited. Ebn Haukal† only says of this port: "Sinia is the port of all Fars or Fariistan; from thence the seashore winds to Bijerm (?). Between Jannabah and Bijerm there are groves and meadows and villages, and the air becomes very warm here."

RISHAHR.—Here are the remains of an important city of great antiquity, where cuneiform inscriptions have been found. It stood about 5 miles to the southward of Bushire, near the centre of the small peninsula of which Bushire occupies the northern extreme. It is in a bay just below a little projecting rocky point, which affords some shelter to boats in north-westerly winds (the prevailing direction). The principal remains are the mounds of a square citadel, and a second mound at some little distance. The former is rectangular in plan, about 400 yards in length and breadth; one side is formed by the sea-coast, here a low cliff, 30 to 40 feet high; at each end are the remains of a spur or jetty thrown out into the sea. The other three sides are earthen ramparts, rising 20 to 30 feet above the level of the ground, of great thickness and with steep slopes; the material has been derived from a great moat surrounding all three sides, which is 70 to 100 feet wide, and still about 20 feet deep. It is in part cut through the rock, which is soft and easily worked. The interior of this vast quadrangle is covered with shapeless *débris* and mounds, with much broken pottery and many splinters of cornelian. I could find no grounds for the assertion that the Portuguese had anything to do with its construction; it in no way resembles any of their work. The remains of the town extend over more than a square mile around this citadel, with mounds and many old walls. The second mound, about 30 feet high, stands about 2 miles off inland of the mounds, and, on being dug into, disclosed a regular structure of burnt bricks, in regular courses, with cuneiform characters stamped on each, which have been recognized by Sir Henry Rawlinson; as of the time of Sennacherib. He calls it the temple of Tirhakeh, the king of Ethiopia, and also says that in the third and fourth centuries it was the seat of the Christian metropolis of Persia, and Johannes, the then incumbent, sat at the Nicean Council in 325 A.D.

In Yakut‡ it is stated that it existed before Islamism, and was inhabited by writers who registered things relative to the sciences; and, further, that a great battle was fought here during the Moslem invasion, under the general of Omar, El Hakam el Thakafi, in which the Persians were routed and the town taken by assault, and that, owing to the energetic resistance of the Persians, it was as celebrated as the great day of Kadesia. After the conquest the place declined, but subsequently attained some importance under the Mohammedan rule.

Sir W. Ouseley§ says, on the authority of old persons of the neighbourhood, that Rishahr formerly contained about 700 families, employed in cutting and polishing cornelians and other ornamental stones. Also that jars bearing sculptural devices, beads, rings, coins, and arrowheads, all of which were attributed to the Gabrs, were dug up.

He says that Hamdallah Uzvini dates the foundation of the place from Lohrasp

* Translated by M. Reinaud. Paris: 1848.

† Translated by Sir W. Ouseley. 1800.

‡ Vol. I., *R.G.S. Proceedings*, 1855-57.

§ Dict. Géogr. de la Perse fran Yagout (born 1178, died 1220). By C. Barbier de Meynard.

|| 'Travels in Various Countries,' etc. London: 1819.

of the Sasanian dynasty (about 500 a.c.), and that it was rebuilt by Ardeshir Babakan (about 230 a.d.). This Arabian geographer (of the fourteenth century) adds that it is a city or town of middling size on the shore of the Persian Gulf, where, from extreme heat, the air is impure and unwholesome, and most of the inhabitants apply themselves to commerce by sea.

Edrisi* (twelfth century) only mentions it as "a small town, but populous, and has numerous dependencies." Thermenot (seventeenth century) says it has a little port, and calls it an island. Its trade was transferred to Bushire during the eighteenth century. What the trade was, or with whom, I have not traced any indications.

Nearchus' account is not very clear. It is supposed that the station Mesambria was near this place, he calls it a peninsula, with gardens and fruit-bearing trees of all kinds, which would be appropriate; but also mentions the mouth of a river, which would seem to point to Halila bay, at the southern end of the peninsula, in which is the entrance of a large creek.

Probably the most ancient remains, discovered by Mr. Bruce, the British resident, also by Sir W. Ouseley and others, are certain funeral urns of baked clay. They were long in proportion to diameter, and the lower end was pointed, and they contained crumbling human bones.

On the highest part of the peninsula stands an old mosque, now ruinous, and called Imāmzādah. It is not remarkable in appearance, and I did not learn anything of its history. It stands within the circuit of the ancient city. There is also a small domed tomb, containing a cemented tomb, of a Mohammedan saint, 9 feet in length. The people believe this to have been the stature of the holy man, and it is called Shish-gazs (*i.e.* Six-ells).

There are some wells to northward of the mounds, which have the best water on the peninsula; they are attributed to Shah Bahman, and are still called Chah-i-Bahmani (*chah* = well).

There are many fruit gardens among the ruins. Excellent grapes and other fruits are grown: the vines generally grow in old wells. I was not fortunate enough to find any curiosities, but the fragments of cornelian mentioned corroborate Ouseley's account of the gem-cutting industry.

EGYPT AND ABYSSINIA.

By Professor LEO REINISCH†

EGYPT and Abyssinia, with their ancient civilizations, stand in a position of marked contrast with the rest of the native states of Africa, characterized as they are by a complete absence of culture. Whilst for this reason the latter fall easily into the hands of the civilized states of Europe, the former have down to the present day borne a certain stamp of independence, which, in the case of Abyssinia especially, shows itself in the possession by the people of a real national spirit.

Both Egypt and Abyssinia lie on the shores of the Red Sea, and both are in touch with the Nile. This similarity of geographical position brought them, even

* 'Geogr. d'Edrisi.' Translated into French, with notes by P. A. Jaubert. 1836.

† Abridged report by Dr. K. Pauker, of a lecture delivered by the author at his inauguration as Rector of the University of Vienna. Professor Reinisch is well acquainted, from personal observation, with the countries dealt with, and is one of the best authorities on all linguistic questions connected with them.

In ancient times, into manifold relations with each other, although the nature of the two countries has influenced their development in diametrically opposite directions. Both states are suited by nature for a high degree of culture—Abyssinia by reason of its elevated and healthy position, which favours work, and of its plentiful supply of rain; Egypt, on the other hand, by reason of the yearly fertilizing overflow of the Nile.

Bounded on either side by the lifeless desert, the Nile valley is of surpassing fruitfulness wherever the fertilizing stream reaches. The irrigation of the valley demands a strictly organized system of labour, on which the whole people must bring their united strength to bear, whilst the open nature of the country gives no scope for insurrection, and the wide desert on either side renders the flight of the disaffected or of rebels impossible. These natural conditions brought it about that more than 5000 years ago the government of Egypt took the form of a despotic monarchy.

This despotism, whilst it wrought wonders for the material prosperity of the land, and for the advancement of science and art among the upper orders, entirely robbed the common folk of their free development. From the most remote antiquity down to our own day, this naturally favoured land has witnessed no social change or advance. Dynasty has followed dynasty without any alteration in the condition of the people, whose destiny has been shaped for them entirely without their own intervention. Nor has religion done aught to break the yoke of slavery. Hence the conquest of Egypt has been an easy task for foreign nations. With a people little interested in the fortunes of their rulers, it is no wonder that in turn Ethiopians, Assyrians, Persians, Macedonians, Romans, Arabs, Turks, and Franks have been able to make themselves masters of the country. Egypt can, in fact, remain an independent state only so long as no foreign enemy covets possession of the land.

Very different is the case in Abyssinia. The broken nature of the ground, and the fact that the several provinces are separated one from the other by steep, rugged, and often impassable mountains, or by deeply cut ravines, puts the greatest obstacles in the way of a united government, and favours the formation of a smaller and more independent class of states. For the same reason the old inhabitants of Abyssinia, who are related by blood with those of Egypt, have been formed into a number of separate races with distinct languages, whilst their kindred in Egypt had, on the contrary, by reason of the natural character of the country, become moulded into a homogeneous people with one language even before the dawn of history. Various circumstances, however, especially the introduction of Christianity into the country in the time of Constantine the Great, have so acted on the people of Abyssinia, that even there the inhabitants of the separate provinces have likewise in a measure become united, on a federal basis, into a single political organism.

This kingdom has gained strength and power of resistance, not merely from the protection afforded by its natural features, but more than all from the possession of a supreme dynasty, to which the various kings and chiefs (mostly hereditary) of the separate provinces are subordinate, and of a common state language, the so-called Amharan, which every Abyssinian, to whatever race he may belong, strives for his own advantage to acquire as perfectly as his own mother-tongue. These two factors have so operated, in spite of the various interests represented and the many separate languages current, as to develop a general national spirit in Abyssinia. To give an illustration: if one asks an Amharan, a native of Tigra, an Agau, or a member of any other of the separate peoples, to what nation he belongs, he will answer, "I am an Abyssinian," and a more particular inquiry is necessary to elicit

the information that he belongs to the Ambarans, the Agau, or whatever it may be—although there is no nearer relationship between the two peoples just mentioned than there is, to take an instance from Europe, between the Germans and the Slavs. Thus, in time of danger from without, each man capable of bearing arms, no matter to what race he may belong, is ready at the call of the emperor to seize his weapons and assist to defend the kingdom from the attacking foe.

The inscriptions found in the country throw much light on its history and on the national development of writing and language under Greek and Christian influence. Only such points, however, are here touched upon as are of special interest from the point of view of the geographer, and in relation to the human side of geography. One such point is the question of the place of origin of the *Geez* idiom, which, Semitic itself, has lent many words to the Hamito-Abyssinian tongue, and of the time when it prevailed in Abyssinia. The oldest manuscripts which have come down to us date from a relatively later time—the thirteenth century—and belong to a second golden age of Abyssinian literature. The Ethiopic speech, or *Geez*, has proved to be of Arabic origin, but shows so many divergencies that it was long before its genealogy could be traced with precision. Only since the discovery of the Sabæan writing and speech, and especially through the recent discoveries of Mr. Theodore Bent, has it been possible to elucidate and determine the original connection between Abyssinian and the language of South Arabia, both as regards writing and speech. From the inscriptions which have been discovered in Abyssinia, it can be seen that Sabæan emigrants from South Arabia brought with them their writing and language to Abyssinia, and that these became gradually modified and acquired their later stamp of individuality. A South Arabian origin must also be assigned to the ancient artificial dams still to be seen, the system of terrace cultivation, and the peculiar obelisks with pictures of sun and moon, which differ in form from those of Egypt.

The cause which induced the Sabæans to cross over into Africa is not far to seek. The Sabæans held the Central African as well as the South Arabian trade in their hands from the most remote antiquity. Already in the first book of Moses (x. 7), Seta is put down as the son of Cush, whereby the Sabæans are even then designated as a people settled in Africa. Gradually they obtained control of the whole trade of the Levant, and passed on the products of India, Arabia, and of Africa, from the spice-lands of the Somali coast to Merce, then the emporium of trade with Central Africa, to Western Asia and Egypt. It was not, however, the case that the Sabæan kingdom itself carried on the Levant trade as a state undertaking, but it was a company of Sabæan merchants that aimed at the commercial exploitation of East Africa. The British East India Company and the modern Chartered Company of South Africa had their prototype one thousand years before Christ in the Sabæan African Company. It bore the name *hobašat* (i.e. association or company), the same from which the modern appellation Abyssinia is derived. This company subsequently broke away from the Sabæan mother-country in Arabia, and founded an independent kingdom in East Africa, which in later times even entered into hostilities with the older state.

This Sabæan trading company seems to have included a good proportion of Jewish merchants, who had wandered for purposes of trade to South Arabia in the time of the first Jewish kings, and now extended their operations to East Africa. To these Jews was probably due the hold which the Mosaic religion acquired in the country, as is shown not only by the tradition of the descent of their mythical king Melisek from Solomon and the Queen of Sheba, but by the fact that at the present day over a million souls in Agamelel and other provinces profess Judaism, and that certain Jewish customs, such as the distinction between clean and unclean

ments, still prevail even among the Christian population. Yet after the fifth century Christianity made rapid progress, so that Cosmas Indicopleustes (520 A.D.) could already speak of Abyssinia as a Christian power.

Until the thirteenth century our information respecting Abyssinia is scanty and mostly unreliable. But inasmuch as the second flourishing epoch of Ethiopian literature fell at this time, whilst in the intervening centuries the lands of Shoa, Gojam, Enares, Harar, Gurague and Kaffa were Christianized and in part incorporated into the Abyssinian Empire, we may conclude that Abyssinia pursued her civilizing mission, and that her influence extended to the far south. This state of high culture, which was maintained down to the fourteenth century, was undermined by the advance of Islam, which, having spread beyond the limits of Arabia over the greater part of Asia and over North and East Africa, began gradually to seriously threaten Abyssinia also.

The occupation of Syria and Egypt by the Arabs obstructed both the sea and land routes from Abyssinia towards the north, and ruptured the tie with the Christian mother-church, so that the Ethiopian realm was henceforth removed beyond the influence of Western culture. But beyond this, Islam sought to bring Abyssinia itself into subjection. The coast-lands of the Red Sea, as well as Harar, Enares, Algeden, Barka, Mensa, and Bogos fell little by little into Mohammedan hands, and Christian Abyssinia has been completely hemmed in by Islam; but, thanks to the spirit of her people, and to favourable circumstances, she has maintained her own natural boundaries intact down to the present day.

The last Mohammedan aggression took place in 1876, when 3600 Egyptian troops attempted, without previous declaration of war, to overrun the province of Tigre in order to bring Abyssinia into subjection to the Egyptian state. Professor Reisch was at the time on a journey to Abyssinia, and witnessed the patriotic spirit which inspired the people. On the selfsame day that the Egyptian troops began to land at Massawa, swift messengers carried the news thence into the interior. From hill to hill blazed the far-seen beacon fires, and war-cries rang throughout the provinces of the kingdom. On the following day the centres of population already resembled military camps. Priests and monks were everywhere preaching a holy war for the defence of the cross and the fatherland. Without military summons or recruiting of volunteers, all the able-bodied men of their own accord got ready their guns, swords, and lances. Women and slaves looked to the supply of provisions, and within a week 20,000 well-equipped men turned out from the province of Hamasen alone, to occupy the mountain pass towards Tigre, before the Egyptian troops had left Massawa. The outcome of the war, so fatal to Egypt, is well known. It gave the immediate impulse to the events which finally led to the occupation of Egypt by Great Britain.

As regards the probable destination of Abyssinia, Prof. Reisch gave it as his opinion that—at least within a measurable time—it will certainly not share the fate of the Egyptians. They have been for centuries a nation of slaves, the Abyssinians a race of freemen. The conquest of the country by a nation capable of bearing the great expense necessary is of course possible, but it may be safely said that it is a much lighter task to conquer Abyssinia than to govern it afterwards. For, in spite of the fertility of certain provinces, it is to-day a poor country, having been exhausted by its wars. To bring back its prosperity, the blessings of a secured and lasting peace are urgently needed.

In order, then, that the great natural riches of Abyssinia may be thrown open to European trade and industry, there is no need of a war, or of a costly establishment of sovereignty over the land. The old Sabæans, and in after-days the Greeks, never went to war with Abyssinia, yet the mother-countries were enriched by its

treasures. In return they bestowed on the Abyssinians the blessings of culture and of a firm political status. The same method is to-day the only proper, and in fact possible, one for gaining over Abyssinia to European interests; and it is now so much easier than formerly, inasmuch as we have to do at present, not with rude barbarous hordes, but with peoples possessed of a political organization and in great measure Christian.

By securing firm friendship with the actual rulers, and by fostering trade and commerce, industry and agriculture, Abyssinia may be enabled to take her place on an equal footing with the nations of Europe within a few decades. The immediate advantage of this closer connection will naturally benefit that state which dominates the course of the Nile and the approaches to the Red Sea.

THE MONTHLY RECORD.

EUROPE

The River System and Watercourses of Switzerland.—Our oldest honorary corresponding member, Prof. Paul Chaux, of Geneva, has sent us the following note on the watercourses of Switzerland: A Federal hydrographic office has, with the help of some Cantonal governments, spread over the territory of Switzerland a net of limnietric stations, where observations on the slope, depth, discharge, width, and variations of the watercourses are regularly carried on, and has for the last twenty years published half-yearly tables, the working out of which will be a task of some length and difficulty. The present report* is the result of observations, bearing, from a special point of view, on that part of the basin of the Rhine included within its three sources and its meeting with the river Tamina, near Ragaz, fifteen limnietric stations having been established on its area. Their height has been measured by a survey of precision from a horizontal line cut, by order of the late General Dufour, on a colossal granitic boulder rising in the harbour of Geneva, called *Pierre du Nilon* (Neptune), marked with the letters N.P.R.P.N., and supposed to be 376·86 metres above the level of the sea. The depth of the water in the cross-sections has been carefully measured at every metre of its width, as well as the height and profile of the banks, to a distance from the actual immersed bed that will allow the immersed cross-section at any given rise or fall of the level of the stream to be calculated. The engineers have been at the trouble of measuring the horizontal surface of the watershed of the most insignificant tributaries of the Rhine, such as they are, when divided by horizontal curves 300 metres from each other. The whole surface of the above-given region is thus found to be 4454 square kilometres, out of which 1020—above 2400 metres from the level of the sea—may be reckoned as belonging to eternal snows; 167 square kilometres only, however, are ascribed to actual glaciers and to the *névés* where they originate. Of the whole surface 1039 square kilometres are, moreover, covered with rocks and shingle, 787 square kilometres with woods and plantations, 4 only with diminutive lakes, leaving for agriculture 2403 square kilometres of poor soil. The patient labour of the engineers gives us the surface and extent of watershed of ninety-four tributaries of the Vorler Rhein, of one hundred merging in the Hinder Rhein, and of seventy-nine more tributaries of the united streams between Reichenau and Ragaz—a total of

* 'Régime des Eaux en Suisse . . . Travail exécuté par la Section hydrométrique de l'Inspection fédérale des travaux publics, 1896.'

273; out of which the Medelser Rhein (Middle Rhine), the Glenser, the Plessur, the Landguart, and the Tamina are alone of any importance. The limnietric measurements of the stations give a width varying between 24 and 43 metres, with a maximum depth of 0.53 metre and 1.0 metre only, increasing, after their union at Reichenau, to a width of 42 and 72 metres; with a maximum depth of 0.66 metre and 2 metres.

Explorations in North-Eastern Iceland.—To the last number of *Petermann's Mittheilungen*, 1896, Mr. K. Kellback contributes an account of Dr. Th. Thoroldsen's journey in the north-east of Iceland in the summer of 1895. The district explored lies to the north and east of the north-eastern part of Dr. Grossmann's route, as shown on the map of Iceland in vol. iii. of the *Journal*, opposite p. 356, and embraces the three peninsulas of Tjörnes, Melrákka Slétta, and Lánganes. The principal result of the journey was the ascertainment of the fact that the extensive area of recent volcanic activity which separates the western and eastern basalts of Iceland, between the Vatnajökull and the Myvatn, extends northwards to the Arctic ocean, the only remnant of the basalt being a mass in the peninsula of Tjörnes inclined to the north-west. The whole region is a vast area of depression, which is bounded on the west by a fault with a considerable dowthrow. The basalt has sunk, and at the numerous fissures running parallel to the marginal fault enormous quantities of breccias, tuffs, and lava have been thrown out. This volcanic activity is pre- as well as post-glacial, but there is an important difference in the character of the lavas—those showing distinct traces of having been traversed by inland ice being composed of light dolerites, while those of post-glacial date are formed of dark-coloured and more or less dense basalts. A very important discovery is the fact that the tuff formation, composed of tuffs, ashes, and breccias, partly converted into palagonite, is of various age. Part of it is overlaid by pre-glacial lava-streams, while another part is of later age. The account of this journey in *Petermann's Mittheilungen* is accompanied by a map, coloured so as to distinguish basalt, tuff, pre-glacial and post-glacial lava, pliocene deposits, diluvium and alluvium, and drift sand.

Germans in Hungary.—P. Langhans has contributed to the December number of *Petermann's Mittheilungen*, 1896, a map showing, by means of six colours distinguishing different percental proportions, the distribution of German-speaking people in the lands of the Hungarian crown and the adjacent parts of the Austrian crown lands, according to the census of 1890, Stieler's map on the scale of 1: 1,500,000 forming the topographical basis. In an explanatory article, he states that the special basis for his map was prepared by inserting the results of the language enumerations of 1890 on the special map of the Austro-Hungarian monarchy on the scale of 1: 75,000. He adds that, except in one case, he has, in spite of various weighty counter-considerations, adhered to the official figures. The one exception is Budapest, where, he states, the official desire to arrive at a preponderance of Magyars in the capital has undoubtedly led to a depreciation of the German element. This city has accordingly been assigned to the percentage next above that which the official figures warrant. In general, in Galicia and Bukovina, the communes and estates (*Gutgebiete*) have been taken as the basis of colouring for the sake of correspondence with Hungary. Villages within such areas have been taken into account separately only where a comparison of the numbers made it certain that otherwise the presence of German colonies would not have been shown on the map. This map also makes the attempt, for the first time, to distinguish German-speaking Jews, where found dwelling together in considerable numbers. Where the number of German-speaking Jews in a commune

exceeds in number the Germans by race, the corresponding colour is dotted; otherwise it is left plain.

Germany—New Geographical Society.—The January number of *Petersmanns Mittheilungen* announces that, after an interval of twelve years, an addition has been made to the number of German geographical societies, through the foundation at Giessen, at the beginning of December, 1896, of a society for geography and ethnology. It is due to the efforts of Prof. W. Sievers, and already numbers 200 members.

Explorations in Cerigo and Cerigotto.—Dr. Richard Leonhard, of Breslau, has recently spent some weeks in the geographical and geological exploration of the Ionian islands, Cerigo and Cerigotto. Since the days of British administration these remote islands have become more and more out of the world, and Dr. Leonhard's observations are accordingly the more valuable. A large number of determinations of position, height above the sea, etc., furnish useful additions to the Admiralty charts, now fifty years old.

ASIA.

Sir George Robertson on Kafiristan.—The full account of Sir George Robertson's visit to Kafiristan, a preliminary report of which was read to the Royal Geographical Society in June, 1894, and published in the *Geographical Journal*, vol. iv. pp. 193-218, appears as a handsome volume with illustrations by Mr. McCormick.* The book consists of a detailed narrative of the author's travels and residence amongst the Kafirs, interspersed with chapters on the people and their ways. In addition to the fuller light he throws on the character of the people by the description of his daily life amongst them, the book deals with several subjects which considerations of space made it impossible to treat in the paper. The domestic life of the Kafirs is most sympathetically treated, with keen appreciation of the peculiarly difficult character of the people, in which good and bad qualities seem to be blended in an unusually complex manner. Their ceremonial dances and feasts are well described, and the funeral customs are dealt with in detail. The erection of effigies of all people of importance within a year after their death is one of the most interesting of these. The houses and their contents are carefully described, and a good deal of information is given as to the temples and shrines of the gods. The domestic life, including the position of women and slaves, exhibits many curious traits recalling the customs of primitive tribes in widely remote regions. This part of the book furnishes a vast amount of new material for the anthropologist, the more valuable on account of the medical training of the author; but we miss an account of the language of the Bashgul Kafirs, with which he had made himself familiar. The narrative of the visit to the remote Peshan valley is of the greatest interest, and every reader must regret that it had to be cut short, as the glimpse given of it seemed to promise far more of novelty and interest than could be found in the valleys easily accessible from Chitral. It seems unlikely now that an opportunity will ever occur for an educated European to study the unaltered people of that remarkable valley where so many memorials of primitive culture have survived unchanged by the surrounding Islamized people. The value of Sir George Robertson's book to students is seriously lessened by the want of an index.

The Andaman and Nicobar Islands.—We have received from Major R. C. Temple, Chief Commissioner for the Andaman and Nicobar islands, reports of

* 'The Kafirs of the Hindu-Kush.' By Sir George Scott Robertson, K.C.B. London: Lawrence & Bullen, Ltd. 1896.

various cruises made by him in 1894-95 round these groups, during which much attention was given by the officials who accompanied him to the question of the utilization of the forests of the islands, and to an examination of the anchorages and harbours of their coasts. The latter investigations were carried out by Commander Simpson and Lieut. Mitchell, whose charts of the channels and harbours examined accompany the reports. The narrow channels (Homfray and Middle straits) which separate North and South Andaman respectively from the small Middle Andaman, debouching on the excellent Kwang-tung harbour on the west coast, proved to be practicable for large launches. Safe channels were found for the entry of Stewart sound (on the east coast of the north island), both from the north and south, and good anchorages were met with in Macpherson's strait (south of the south island), in the Archipelago, the Labyrinth islands, and elsewhere. The official chart of Stewart's sound proved quite useless, being entirely at variance with facts. The reports of the forest officers, Mr. C. G. D. Fordyce and Mr. E. M. Buchanan, show that, as already found both here and elsewhere on the coast of the Bay of Bengal by Dr. Kurz and others, different classes of forest occur in zones which succeed one another from the coast towards the interior. These are: (1) The mangrove belt; (2) the beach and littoral forests, of which the most important tree is the *Mimusops littoralis*, or "bullet-wood;" (3) the deciduous forests, containing large numbers of the "padouk," or *Pterocarpus Indica*; (4) the evergreen forests, occurring chiefly on the higher hills and the moister spots on the lower grounds, and marked especially by the presence of the "gurjan" (*Dipterocarpus*). The mangroves should give a supply of firewood for a long time to come. The "padouk" is a valuable timber tree, so that its abundance promises well for the prospects of forest-exploitation. It appears to re-establish itself easily in certain places from which it has been cleared; but Mr. Buchanan, who makes a special report on the forest around Stewart sound, parts of which were much damaged by the cyclone of 1893, considers that the new crop in such places is likely to contain a much smaller proportion than the original forest of padouk and other hard woods. Near Stewart sound, as in Burma and in the Andamans generally, the ridges were found to run mainly from north to south, and to be separated by long low valleys occupying a large proportionate area. The commonest rock is sandstone, but, being argillaceous, it forms when decomposed a more or less clayey soil. The country is intersected by creeks, supplying natural waterways for the transport of timber. The examination of the forests gave fresh proof of the resemblance of the flora to that of Burma. Indications of a recent subsidence of the islands were seen in the shape of trees, both dead and alive, standing in the sea, a few mangrove bushes having established themselves between them and the shore. Portions of old brick and stone walls are also covered at high water at the site of the former convict station on Chatham island, but it is possible that the remains are those of a sea-wall. The Andamanese met with were generally friendly. They are an unsettled people, roaming along the shores in search of fish and turtle. Two of the wild Jarawas of Rutland island were captured in the hopes of establishing friendly intercourse, but, beginning to pine and sicken, were sent back to their home.

The Tsangpo of Tibet.—The October number of the *Calcutta Review* contains a carefully written article by Mr. Graham Sandberg, illustrated by two maps, on "The Great River of Tibet: its course from source to outfall," in the course of which we are furnished with an interesting and striking résumé of the existing data regarding the Tsangpo, the only blemish being that Mr. Sandberg does not give his authority in every case, and this in a geographical work is of course, a serious defect. So far, however, as we have been able to test his statements,

they are correct, though we think he might have made mention of Lieut. Wilcox's explorations of the upper Irravaddy, and some other travellers whose researches go to make up the sum total of our present information regarding the mighty Tsangpo. The sources Mr. Sandberg locates approximately in longitude $82^{\circ} 10'$, and about 20 miles south-east of Lake Má-p'ang, where the native tradition places its origin. Glacier-crowned mountains hem it in on three sides, while towards the east the river gradually forms itself in a large gravelly marsh, fed from the adjacent glaciers, and styled, "The Sands of the Mystic Wheel." It is not necessary here to trace the detailed topography of the stream through its eastern course, but it is noteworthy to observe that the still unexplored section of the river between the furthest point to which it has been explored from the Tibetan side and the highest point up to which exploring parties have ascended it from the plains of Assam is only about 70 miles in length, while the distance as the crow flies from the former point to the British frontier is only 25 miles. The total length of the river Mr. Sandberg estimates at 1308 miles up to its union with the eastern Brahmaputra, while its drainage covers some 112,000 square miles. Its sources lie at the altitude of 14,700 feet above sea-level, and for 782 miles the drop is only about $4\frac{1}{2}$ feet to the mile, but after that the fall is very rapid till it emerges from the Himalayas and joins the Brahmaputra at a height of 420 feet.

Journey through Syria to Asia Minor.—The expedition under Roman Oberhummer, after passing through Damascus, Homs, Hama, and Aleppo, Northern Syria, and Cilicia, had in November, 1896, reached Cheshme-Keprikei, on the Halya. Thence Dr. H. Zimmerer, a companion of Oberhummer, writes that the volcanic region of the Erjias-dagh and the Hassan-dagh offered an abundance of matters for investigation in its thousands of tuff cones and its ravines with mysterious artificial caves, and adds that boundless hospitality was experienced in the Greek villages of Tattarin, Nevsehir, Irgib, and Injesu, in the luxuriant wine-country reaching to Kaisariéh, in the course of the numerous excursions made with a view to the mapping of this unknown corner of Asia Minor. Kiepert's commission to make a topographical survey of the Kizil Irmak between Kesekképri and Cheshmeképri was also successfully accomplished, though with no little labour and trouble, the route leading through a long narrow defile, but luckily at a time of extreme low water. The travellers next intended to proceed to the great salt lake of Tuz-göl, to make a breach in Kiepert's "*terra incognita*;" and then, following Ramsay's advice, to return to the Halya to seek for the sites of Parnassos and Nyssa. —*Petermanns Mittheilungen*, December, 1896.

The Russian Fur-Seal Islands.—A very valuable report on the Russian seal islands, by Mr. Leonhard Stejneger, of the United States National Museum, has recently been issued by the U.S. Commission of Fish and Fisheries, a copy of which has been presented to the Library. The report is divided into five sections, as follows: I. Introduction; II. The Russian Seal Islands, including the Commander Islands, Robben Island, etc.; III. Seal Life on Commander Islands; IV. The Russian Sealing Industry; V. Conclusions. Until 1867 all the resorts of the northern fur-seal north of California belonged to the Russian Empire. These resorts were in all instances uninhabited islands. They were discovered by the Russian fur-hunters in the middle and latter part of the last century, and included the Commander group, certain small islands in the Okhotsk sea, certain small islands in the Kuril chain, and the Pribylof group. There only remain in the possession of the Russian Crown at the present date the Commander islands and the islands in the Okhotsk sea. The Commander islands, which were visited by the author on two separate occasions, in 1882-83 and in 1895, comprise two main islands, Bering and Copper, situated off the east coast of Kamchatka, between

54° 33' and 55° 22' N. lat., and 165° 40' and 168° 9' E. long., approximately 97 miles from Cape Kamchatka. Geographically, they are the westernmost group of the Aleutian chain, although politically they form a separate administrative district of the so-called coast province. The group was discovered on November 4, 1741 (Old Style), by Commander Vitus Bering, on his return voyage after having discovered the mainland of America. The climate of the Commander islands is not particularly severe, but the excessive moisture and the low summer temperature make it disagreeable, though not unhealthy. During the author's visit in 1882, he established and maintained a meteorological station at Nikolski, Bering island. The maximum temperature in Bering island was found to be 63° Fahr., while the minimum was seldom below zero during the four years of observation. The difference between the summer and winter extremes is less on Bering island than on St. Paul island, Pribylof group. As might be expected from their situation, the islands are chiefly palaearctic in their bio-geographical relations, with a fair sprinkling of circumpolar, American, and North Pacific forms, the marine fauna and flora partaking more particularly of this latter character. The flora very generally resembles that of the treeless regions of northern Europe. Certain plants found indicate the close relationships to the flora of Kamchatka and the other Aleutian islands. The islands are completely destitute of trees. In 1895, the Commander islands contained a mixed population of about 670 of both sexes. Bering island, the north-western island of the Commander group, is situated between (approximately) 55° 22' and 54° 42' N. lat., and 165° 40' and 166° 41' E. long. Its greatest length from north-west to south-east is a little less than 50 miles, with an average breadth of about 10 miles. The southern two-thirds of Bering island are mountains, with peaks rising to about 2200 feet. The most conspicuous mountain of the southern mass, and the highest on the island, has been named by the author Mount Steller. The northern third of the island has an entirely different aspect from the remainder. It is described as being low, the highest elevation being slightly more than 600 feet. The land rises in a series of terraces till it forms either large plateaus with a somewhat undulating surface, or the tops of regular, flat-topped table mountains. There are two groups of these table mountains. The highest altitude of the former group was found to be 577 feet; of the latter, 617 feet. The two main plateaus are the *Northern plateau* and *Tenkoi plateau*. A number of lakes are stated to exist on the island, among which may be mentioned the large Saranna lake, covering an area of about 20 square miles. There are two seal rookeries on Bering island. The great north rookery is situated on the northernmost prolongation of the island (Severni Mys, also called Cape Yushin), about 11 miles from the main village, Nikolski, and about 10 miles from the north-west cape, Zapadni Mys. The south rookery is situated on the west coast of the island, halfway between the north-west cape and Cape Manati, nearly 16 miles from Nikolski. Copper island lies between 54° 53' 30" and 54° 33' 30" N. lat., and 167° 28' 30" and 168° 9' E. long. (approximately). It is described as very mountainous, long, and narrow, the length being nearly 30 miles, the average width about 2 miles. It is distant from Bering island about 29 miles. From the north-western extremity to the south-east end, the island consists of a backbone of peaked mountains, from 1000 to 2000 feet high, and connected by ridges varying from 500 to 900 feet high. There are two distinct groups of seal rookeries on the west side of Copper island, named Karabelni and Glinka, located in its south-eastern half, about 4½ miles apart. Robben island is situated in the Okhotsk sea, 11 miles south-west from Cape Patience, on the eastern shore of Sakhalin island. This island was not visited by the author. The Robben island seals appear to be a separate and

distinct herd from those on the Commander islands. St. Iona island and Shantar islands are also noticed in the report. The author speaks very unfavourably of the present condition of things as practised by the sealers, and urges the necessity of establishing certain protective measures, which, it is thought, would, in a few years, greatly benefit the fur trade. The report contains some important maps and a number of illustrations.

AFRICA.

Miss Kingsley on West Africa.*—The racy but too brief note of her journey in West Africa in 1895 which Miss Kingsley communicated to the *Journal* (vol. vii., 1896, p. 95) must have created a demand for some more complete description, which the handsome volume now before us fully supplies. Miss Kingsley carried a merry heart with her, and the success of this good medicine is shown by the way in which she escaped serious consequences in the course of extended travels through the most unhealthy parts of Africa. We note with regret that she does not publish her promised map. Apart from the considerable anthropological value of the chapters on fetish, and the importance of her collections of fish, reptiles, and insects, Miss Kingsley has enriched the literature of travel by an extremely entertaining book, which will convey vivid impressions of that strange world to many who would decline more formal instruction. The descriptions of mangrove swamps and their gradual transformation into dry land, and the word-pictures of the tropical forests in which the gorilla wanders, are worthy of special praise. A clever parallel is drawn between the tangled primeval forest, so bewildering on first acquaintance, but afterwards so full of interest and beauty, and the cloudy mind of the native African, which baffles many Europeans to make its acquaintance. There are some slips in orthography which might have been corrected, e.g. *M'Ukugji*, *Tschui* (for *Chi*), *Okijen*, and *Karkola*, for which in a footnote the alternative form *Kakola* is given, the *r* being silent, and therefore, according to the R.G.S. rules, superfluous. The terms "left and right" bank of the Congo (pp. 359 and 361) are misapplied, the term, used geographically, always referring to the right and left hands of a person looking in the direction towards which the river flows. Miss Kingsley states that she is not a geographer, but she proves herself possessed of the geographical instinct in many particulars. She gives a curious account of such instinct in a Fan chief encountered at the Ogowe rapids. "He took a piece of plantain leaf, and tore it up into five different-sized bits. These he laid along the edge of our canoe at different intervals of space, while he told M'be things, mainly scandalous, about the characters of the villages these bits of leaf represented, save, of course, about bit A, which represented his own. The interval between the bits was proportional to the interval between the villages, and the size of the bits was proportional to the size of the village." Miss Kingsley lays stress on the importance of some knowledge of native languages in travellers who attempt to find the native names of places. She states that she found four villages and two rivers named by previous travellers with various native forms of "I don't know."

Two Historical Books on South-East Africa.—Dr. Theal's recent volume † is intended as a supplement to his well-known history of South Africa, rendered necessary, he thinks, by the extended use of the term "South Africa," to include

* "Travels in West Africa: Congo Français, Corisco, and Cameroons." By Mary H. Kingsley. London: Macmillan & Co. 1897.

† "The Portuguese in South Africa." By George M'Call Theal, LL.D. With maps. London: Unwin. 1896.

the whole country up to the Zambesi. The main attention is therefore devoted to the Portuguese possessions south of that river, although the comprehensive sketch of the various early voyages to this part of the world necessarily includes details respecting Mozambique and other northern ports. This limitation is perhaps to be regretted, as, with a slight extension of scope, the book would have served as a summary of the Portuguese dealings with East Africa in general. It is written in Dr. Theal's usual lucid style, and includes an account of the native races of South Africa during the sixteenth century, when the distribution of the tribes differed much from that seen at the present day. Some interesting details on this subject are derived from the accounts of overland journeys made by shipwrecked crews on the south-east coast in the middle of the sixteenth century. At an earlier date, the Portuguese relations with the so-called empire of Monomotapa, including the disastrous expedition of Francisco Barreto, are fully dealt with. Dr. Theal shows that the name Monomotapa was the hereditary title of the chief of the Makalanga tribe, and probably meant either "chief of the mountain" or "chief of the mines." From the beginning of the seventeenth century onwards, the prosperity of the colonies rapidly declined, and Sofala soon lost its importance as a place of trade. In East Africa, no less than in the East, the rivalry of the Dutch and English had been felt, and Mozambique had been partially destroyed by the former in 1609. A revival of activity dates only from the middle of the present century. Dr. Theal looks upon the prospects of Portuguese East Africa with more hope than many writers, considering that they are now brighter than at any time since the fort of Sofala was built by Pedro da Nhaya, in 1505. The second book † we have to notice is concerned with the gold-mining region in Mashonaland, and traces its history, in the light of Mr. Bent's explorations, and of the author's own investigations into the Vatican and other records, from the times of the Phœniciana, through those of the Arabs and Portuguese down to the year 1830. Monomotapa is spoken of throughout as the name of the country, but this is perhaps merely a concession to long-established usage. No attempt is made to show that the empire was of any great importance, judged by European standards; but Mr. Wilmot appears to attribute to the Portuguese a more intimate acquaintance with the interior than is allowed by Dr. Theal. The missionary records quoted show that the Jesuits, at least, were well acquainted with Zimbabwe, where, after meeting with some success in his labours, Father Gonçalo Sôbreira was martyred in 1581. The book contains the reproduction of an Italian map published in 1623, on which the two great central lakes appear in exactly the form in which they were subsequently given in Dapper's map. Mr. Wilmot notes that Monomotapa is well filled with names, but the fact that Abyssinian names appear on its very borders shows that no reliance can be placed on the positions assigned to places in the interior.

Mr. Weatherley's Survey of Lake Bangweolo.—Sir Harry Johnston and Mr. Alfred Sharpe have communicated the substance of letters received from Mr. Poulett Weatherley, announcing the completion of a thorough survey of Lake Bangweolo, and describing a visit to the scene of Livingstone's death. Full details will no doubt be received on the traveller's return to England. The general result seems to be to show considerable divergences in the shape of the lake from that

* An interesting point in connection with the early English voyages alluded to by Dr. Theal, is the proclamation of British sovereignty at Table bay by English officers in 1600, a proceeding which, however, led to no result.

† 'Monomotapa' (Rhodesia). By the Hon. A. Wilmot. With Preface by H. Rider Haggard. Maps and Plates. London: Unwin. 1896.

assigned to it in Giraud's map. Mr. Weatherley likens it to an elongated letter O. Its swampy margins are almost entirely deserted, having little to attract human beings. The country to the south does not appear to be such a continuous marsh as had been supposed, for, although there is plenty of swamp, there are also great extents of beautiful wooded country. Game has been mostly killed off by the rinderpest, but elephants are found in the swamps. Mr. Weatherley describes the scene of Livingstone's death as most impressive, the rugged old mpundu tree,* beneath which the great explorer's heart was buried, forming a most solemn and appropriate monument, standing as it does in the midst of solitude, for the native village has been moved 10 miles to the west. The tree is, however, fast becoming a mere shell, and Mr. Weatherley strongly urges that something should be done to mark the spot in a lasting manner, lest it should soon be hopelessly lost sight of.

M. Versepuy's Journey across Africa.—An account of the expedition of the late M. Versepuy was given by Baron de Romane, the second in command, before the Paris Geographical Society in December last, and appears in the *Comptes Rendus* of the Society (1896, Nos. 17-19). The early stages of the journey need not be touched upon, as they led over well-known ground in Masailand and Uganda. From Mengo the expedition proceeded to Lake Albert Edward, which, according to the French traveller, is separated from the smaller lake Ruberu (Rusango) by a distance of 25 miles, the stream which connects the two lakes being small and unimportant. Rusango is said to be over 600 feet higher than Lake Albert Edward, and to form a vast marsh, although, according to Captain Lugard, there is no swamp around it except at the north-east end. The Semliki valley was found to be peopled by fugitives from Unyoro. Just within the limits of the forest region, a small Arab outpost flying the flag of the Congo State was reached. The route led from the upper Semliki to the Ibina, a southern tributary of the Ituri, to which its course was followed. The forest was high, and a path had to be cut through it, much difficulty being experienced from want of supplies. Elephants and leopards abounded. Crossing the Ituri, the expedition reached the military post of Kilongolonga, belonging to the Congo State, where three Belgian officers were met with. Reaching the still more important post of Arakubi, the travellers obtained canoes and descended the Ituri and Aruwimi to the Congo. They describe the great forest as continuous from the Semliki valley to Leopoldville.

Captain Ramsay on Ujiji and Tanganyika.—An expedition under Captain Ramsay, well known for his surveys in various parts of German Africa, has reached Lake Tanganyika, and there is every prospect that European influence, which received a serious check in these regions at the time of the Arab revolt in German East Africa, will soon be re-established. The town of Ujiji does not, according to Captain Ramsay (*Deutsches Kolonialblatt*, December 15, 1896), present the ruinous appearance which had been reported. It still extends over a large area, and contains at least as many inhabitants as Tabora. The fall in the level of Tanganyika has left a wide sandy plain between it and the water, but for the last two years the sinking of the water has ceased.† The Arab traders will welcome the establishment of a German station at Ujiji, as likely to cause a revival of trade. At present

* Mr. Weatherley has sent home some of the leaves of this tree as a memento.

† Mr. A. Whyte, an account of whose journey in the mountains west of Nyasa has been lately appearing in the *British Central Africa Gazette*, says that Lake Nyasa rose higher in 1895 than it had been known to do for fifteen years, so that it would seem that a period of general rise in the lakes of Central Africa may have lately set in. We hope to notice Mr. Whyte's journey further on receipt of the final instalment of his narrative.

It is at a low ebb. The slave-trade has fortunately entirely ceased, but that in ivory has also suffered a diminution, owing to the Belgian activity on the west side of the lake. The chief ivory districts are Manyema and Uvira. Salt, obtained from Uvinza, is an important article of trade, the whole of the country west, east, and north of the lake being supplied from this source. Captain Ramsay made a journey to the north of the lake, being well received everywhere. In Kafagga, east of the Congo State boundary, an important daily market is held. He ascended the course of the Lusizi (Rusizi) during a three days' march, and found it a copious stream, navigable for canoes, and receiving many tributaries from the mountains of Urundi, and bringing to Tanganyika at least as much water as the Malagarasi. Its valley is a wide almost treeless plain, and the whole region abounds in elephants. Urundi made a great impression on the traveller by its fertility, and its banana plantations recalled those of Konde, at the north end of Nyasa.

Steam Transport in German East Africa.—The success which has attended the placing of the steamer *Hermann von Wissmann* on Lake Nyasa has led to the formation of a similar project with reference to Lake Tanganyika. A committee has been formed under the presidency of the Duke of Mecklenburg-Schwerin, and at a meeting held on November 4 last it was decided that the project should be proceeded with. Lieut. Schloffer, who in 1892-93 visited the Victoria Nyanza in furtherance of the aims of the German Anti-Slavery Committee, has been chosen to carry out the work, and hopes to combine with it scientific investigations into the geology, geography, and anthropology of the regions traversed. The route *vis* Lake Nyasa has been chosen for the transport of the sections, but it has not yet been decided whether the material shall be steel or aluminium. The steamer is to be named *Helwig von Wissmann*. It is proposed, also, to transport a steamer in sections, *vis* Lakes Nyasa and Tanganyika, for the Victoria Nyanza (*See Allen Whitteisen*, pt. I, 1896; *Petermanns Mittheilungen*, No. 11). As regards the navigation of Lake Nyasa, the reported discovery of extensive coalfields between the Kivira and Songwe rivers, by Herr Bornhardt, seems likely to be of importance (*Geographische Zeitschrift*, 1896, No. 12). The construction of the railway to Lake Tanganyika does not appear to have been definitely decided on. At a discussion before the German Colonial Society in Berlin in November last, Major von Wissmann urged the necessity of such a railway, but deprecated undue haste in its construction. The line from Tanga towards the interior has reached Muheza, at the end of the first stage, and there is a regular service once a week in each direction; but want of funds prevents its extension even to Korogwe on the Ruw, and the future of the undertaking must depend on the result of the larger scheme (*Deutsches Kolonialblatt*, 1896, p. 374).

New Project for a French Niger Railway.—As early as 1888 a scheme was formed in France for the construction of a railway to the upper Niger from some point on the coast of French Guinea, the distance hence to the river being no greater than that from Kayes, the starting-point of the Senegal railway. The idea was, however, dropped for a time, owing to the fact that the Anglo-French delimitation gave to Great Britain a portion of the territory through which it had been proposed to carry the line. A survey has since (1895-96) been carried out by Captain Salese by a slightly more northerly route, starting from Konakry instead of Benty, and an account of the main results appears in the December number of the *Bulletin du Comité de l'Afrique Française* (p. 373, with map). The survey was based on theodolite observations, which supplied the material for a map on the scale of 1:50,000 for the first half of the distance, during which the country consists mainly of sandstone or of plateaux covered with laterite. There are some difficult places, the worst of all being at the passage of the ridge of Kolosoghea, between

the basins of the Kaba and Mongo rivers. The route debouched on the Niger at Faranna, which is, however, situated above the last rapids. Captain Saleasse, therefore, recommends Somoréla, lower down the Niger, as the terminus, the second half of the route diverging, in this case, to the north of that surveyed, and probably leading through a less difficult country. This line, if constructed, would prove a serious rival of the British Sierra Leone railway.

Positions fixed by M. Foureaux in the Northern Sahara.—A list of positions fixed by M. Foureaux during his journey of 1895-96 (*Journal*, vol. vii. p. 263) is given in the *Comptes Rendus* of the Paris Geographical Society (1896, pp. 304, 305). They are based almost entirely on observations of stars, and relate to the eastern part of the Algerian Sahara, between $29^{\circ} 40'$ and $33^{\circ} 40'$ N. lat.

AMERICA.

The Headwaters and Length of the Missouri.—Fresh from his investigations at the sources of the Mississippi, the Hon. J. V. Brower started, in the summer of 1895, to discover the headwaters of the Missouri. Near Three Forks the Gallatin joins the united waters of the Madison and Jefferson, thereafter known as the Missouri. The Jefferson fork, considered to be the main stream, is known as Beaver Head creek, then as Red Rock creek higher up. Driving from Lima, Mont., up this Red Rock creek, Mr. Brower soon reached the expansions of the stream known as the lower and upper Red Rock lakes, and started exploring the rivulets that feed the latter. The survey maps show the Red Rock creek above the upper lake, formed by the junction of two streams, marked the North and South forks. Mr. Brower says, "The two forks were found to flow out from Culver's cañon . . . and, after a meandering circuit, of about 3 miles, they come together again . . . Discovering that the principal stream issued out from it (Culver's cañon) in four channels, cast asunder by an impetuous current plunging over a débris mass to a quaternary division, a thorough exploration of the locality was deemed advisable and necessary." The gorge is of a rugged character, and at one point "is located the site of a former cataract, now a rapid, where the mountain range has been practically severed in twain by the eroding action of increasing and long-continued flowage." It would appear the place well deserves the graphic name it bears—Hell Roaring cañon, which Mr. Brower wishes to replace by Culver's cañon, after the settler who accompanied him to the source of the Missouri. This source is not far from the end of the gorge, in a "hole in the summit of the Rocky mountains," at an elevation of about 8000 feet. From this hole to Three Forks, Mr. Brower estimates the length of the river at 398 miles; from Three Forks to its confluence with the Mississippi is 2547 miles, and from the latter point to the south-west passage at the delta is 1276 miles. The total length of the Missouri-Mississippi is thus 4221 miles. Mr. Brower gives this and much miscellaneous information, which would have been the better for more careful editing, in his book—*The Missouri River and its Utmost Source: Curtailed Narration of Geologic, Primitive, and Geographic Distinctions descriptive of the Evolution and Discovery of the River and its Headwaters* (St. Paul, Minnesota, 1896).

AUSTRALASIA.

New Zealand Alps.—This volume* is a record of the explorations and adventures of the surveyors employed by the Government of New Zealand, in the years

* *Pioneer Work in the Alps of New Zealand: a Record of the First Exploration of the Chief Glaciers and Ranges of the Southern Alps.* By Arthur P. Harper, M.A. With maps and illustrations. London: Fisher Unwin. 1896.

1893-95, to investigate and map the western valleys and glaciers of the central portion of the Southern Alps. Mr. Harper gives a very straightforward and lively description of the difficulties and hardships encountered by Mr. Douglas and himself in their task. He leads his readers through trackless gorges, where the rate of progress was sometimes little more than a mile a day, to the icefalls which pour down from a crest of 8000 feet to within 700 feet of the sea-level. In New Zealand, as elsewhere, it is found that the glaciers that descend lowest are those which combine steep beds with considerable *nœv* basins, and therefore move with the greatest velocity. Mr. Harper's measurements indicate that the respective falls of the Tasman and Franz Josef glaciers are 187.7 feet, and 108.4 feet per mile, while the maximum rate of motion of the latter stream is more than fourteen times as great as that of the former. There are, on the western slope, some very remarkable specimens of *glaciers remanits*—glaciers, that is, which are reformed after falling in avalanches over a cliff. The forests, tree-ferns, and scrub of this side of the range are a great addition to the scenery, but, until tracks have been blazed, a terrible hindrance to the explorer, whose difficulties have further been increased by the destruction of the native wingless birds, which served him as supplies, by the cats and weasels imported into the island. Mr. Harper furnishes valuable facts and some arguments as to the geological structure of the range, the present movements and past extension of the ice, the fauna, and flora. He is observant of nature in many forms, and his pages are full of varied interest. The region he describes has hitherto been approachable only by a circuitous road, liable to frequent interruption. Mr. Harper points out that the construction of a summer horse-track over the direct pass from the Hermitage to the west coast, first recognized and crossed by Mr. Fitz Gerald in 1895, though delayed by want of funds, must before long be carried out. When this has been done, other tracks will no doubt be blazed, and "visitors to the glaciers" will become, at least, as common in New Zealand as they were in Savoy a hundred years ago. Recent publications have raised a question as to what is the true and most appropriate meaning of the expression "Southern Alps," which climbers and colonists have used in very various senses. A full exposition of the matter will be found in the February number (135) of the *Alpine Journal*. Mr. Fitz Gerald has explained that he limits the term to the central portion, or Mount Cook group; the Surveyor-General of New Zealand (Reports 1895-99), and several New Zealand climbers, appear to treat the unbroken crest between Haast's pass and Whitcombe's pass as the "Southern Alps proper," but write generally of the Southern Alps with some indecision as to their limits. Mr. Douglas Freshfield suggests that the course most likely to obtain general acceptance is to include in the "Southern Alps" all the glacier-clad ranges south of Harper's pass. This would be in accordance with the indications of Captain Cook, who on his map brings the Southern Alps up to the latitude of Banks's peninsula. Of course, if the term is to be understood in this sense, recent claims to "the first crossing of the Southern Alps" must fall to the ground. The first complete crossing to the western sea over the snowy ridge 100 miles long, between Haast's and Whitcombe's passes, was that made by the Messrs. Pringle and Blythe, at the head of the Godley glacier, in 1892; and the first complete crossing, from the Hermitage over the Mount Cook group to the sea, by Mr. Fitz Gerald and Zurbriegen, of Macugnaga (who is an Italian, and not a Swiss guide), in 1895. On the flanks of the range the glacier summits are arranged, not in lines, but in groups separated from one another by grassy gaps, which were most of them crossed many years since, and over one of which (Arthur's pass) a coach has long run, and a railway is in construction. A good map, closely resembling that already issued with Mr. Fitz Gerald's book, and based mainly on the same sources—

that is, on the separate maps which have accompanied recent New Zealand Government Survey Reports, and as to the west coast, on Mr. Harper's and Mr. Douglas's own work—renders the narrative intelligible. The illustrations are numerous, but have more topographic than artistic merit.

GENERAL.

Mr. Hogarth's Travels in the Levant.—This little book,* which is illustrated by thirteen beautifully executed plates from photographs or sketches, is one of rare and manifold interest. Its two hundred pages sum up the impressions and observations of numerous journeys in the interests of learning in Asia Minor, Cyprus, and Egypt, spread over the interval between 1867 and the beginning of 1896, and an exceptional combination of qualities in the author makes the result of peculiar value. The scholarly mind is apt to be oppressed with the weight of tradition and dogma; but throughout this work we have scholarly lore and feeling united with genuine independence in the point of view, and to these qualities are added sympathetic insight, catholic with the catholicity of one who has surveyed with human interest the vicissitudes of the ages; in descriptions of scenery, an eye both for broad effects and picturesque or telling detail, and a power of calling up not only the scene but the emotion of the scene, whether arising merely from the natural aspect or the human associations; and everywhere literary skill and taste, including an unusually fine sense of the melody of prose. For geographers, perhaps, the most interesting piece of description is that on pp. 84-89, of "that matchless cornland, the Central Axyton Plain," which "cartographers write . . . a desert," so that, according to Mr. Hogarth, "that term must include an undulating treeless plain which sends up corn breast-high for the scratching of a Homeric plough."

Sir Joseph Banks's Journal.†—Following on the recent publication by Admiral Wharton of Captain Cook's own journal kept during his first voyage, the reprint of Sir Joseph Banks's journal during the same voyage, under the able editorship of Sir Joseph Hooker, comes opportunely to further enrich the literature on the subject, which is now unusually complete. As is stated by Sir J. Hooker in his preface, the great services rendered by Banks, both to natural science in general and to this expedition, have so far been by no means adequately recognized. The journal, now published for the first time in full, was placed by Banks in the hands of Dr. Hawkesworth, when the latter was bringing out his edition of Cook's voyage, and the extensive use made of it may be seen by comparing the present volume with Cook's own journal. In fact, almost the whole of the account as given by Hawkesworth, with the exception of the details relating to navigation, are from the diary of the naturalist, of the extent of whose services Cook himself was deeply sensible. Not only were the results from an ethnological point of view almost entirely due to Banks, but his active co-operation in the general labours of the expedition was no less valuable. In addition to many identifications of plants and animals mentioned by the writer, Sir Joseph Hooker supplies an interesting biographical sketch of his life, while the book also includes a life of Dr. Solander, and notices of the earlier voyagers and naturalists mentioned in the narrative, from other pens. The reprint has been made from a copy of Banks's journal taken in

* * *A Wandering Scholar in the Levant.* By David G. Hogarth. Second edition. London: John Murray. 1896. Size 7½ x 5½, pp. 206. Plates.

† *Journal of the Right Hon. Sir Joseph Banks, Bart., &c., &c., during Captain Cook's First Voyage.* Edited by Sir Joseph D. Hooker. Portraits and charts. London: Macmillan. 1896.

1833, the original having been unfortunately lost through the dispersal of the Banks collection of papers by sale to autograph-collectors. The distressing history of the manuscript is given in detail in the preface.

Death of S. S. Rogozinski.—The Polish traveller, Rogozinski, well known for his explorations in the Cameroons in the years 1882-84, and for his ascent of Clarence peak, on Fernando Po, in 1880, died in Paris early in December last.

CORRESPONDENCE.

Popocatepetl.

Gresham House, London, E.C., January 30, 1897.

Since my return from Mexico this month, my attention has been drawn to the communications of the Rev. W. A. B. Coolidge, Mr. W. T. Munro, and Prof. Angelo Hellprin, in the *Journals* of September and January last, referring to my paper on "Popocatepetl and the Volcanoes of the Mexico Valley." I am greatly obliged for the references to Mr. Whitehouse's description, which I will take an early opportunity of studying.

I may remark, however, that my paper was intended to deal generally with the transcontinental volcanic belt, and not with Popocatepetl alone. The accounts of the ascents of Ixtaccihuatl, and especially the alleged existence of a crater, will be of peculiar interest to me; though I may point out that even this latter fact is not inconsistent with my view that the mountain itself "does not represent any eruptive vent." The evidence of a transcontinental rift, which I have endeavoured to establish, would be strengthened by the signs of another lateral break into the older porphyritic series, similar to that of Texootzingo to which I referred (p. 148 of *August Journal*).

Mr. Munro and Prof. Hellprin have slightly misunderstood my remark about the "eternal snows." There is, of course, always plenty of ice and snow to be found at those altitudes, and at certain points they may rarely, if ever, disappear. What I pointed out was that there is no defined limit above which they are perpetual. When I left the state of Puebla in October last (since the date of my paper), the whole eastern side of Popocatepetl was clear of snow almost to the crater-level. This is not uncommonly the case in some seasons, and, I think, fully warrants the statement that there is "no snow-line." On the western or Mexico side, from which the ascent is usually made, the snow always lies heavier and longer, but is similarly subject to much variation.

Prof. Hellprin expresses a doubt as to the "existence in fact" of the east-and-west volcanic fissure. As he does not, however, mention any reasons for the doubt, it is not within the reach of discussion.

O. H. HOWARTH.

OBITUARY.

Frederick J. Mouat, M.D., LL.D.

SURGEON-MAJOR FREDERICK MOUAT, formerly Inspector-General of Prisons in Bengal, died at his residence at Kensington on January 12 last. He was born in 1810, being the son of Surgeon James Mouat, of the King's Hussars and the 13th Light Dragoons. After studying at University College, London, and at

Paris, he proceeded to Edinburgh University, where he obtained the degree of M.D. in 1839. The best years of his life were spent in India, where he held various Government appointments—including, among others, those of Deputy Inspector-General of the Bengal Army, Inspector-General of Prisons in Bengal, Professor of Chemistry and *Materia Medica*, and Professor of Medicine and Medical Jurisprudence; he was also secretary of the Council of Education, Bengal. In 1857 he undertook an expedition to the then rarely visited Andaman Islands, with a view to the selection of a site for a penal settlement, and he described the results of his visit in a paper read before the Royal Geographical Society, and printed in vol. xxxii. of the *Journal* (1862). The full report on the expedition had already appeared in India as the 25th number of the 'Selections from the Records of the Government of India' (1859). One of the results of the expedition was the discovery of the harbour since known as Port Blair. In 1863 Dr. Mouat published a volume entitled 'Adventures and Researches among the Andaman Islanders.' In a work published in Calcutta some years before, he had described a trip to Réunion, Mauritius, and Ceylon, discussing the question of their eligibility as sanitariums for Indian invalids. His other works and papers deal chiefly with medical subjects and questions relating to prisons. He was joint author of a 'History of the Statistical Society of London,' published in 1885, and was President of that Society in 1890-92. He became a Fellow of our Society in 1861. He was twice married, in 1842 and again in 1880.

Sir J. B. Thurston, K.C.M.G.

Sir John Bates Thurston, High Commissioner in the Western Pacific and Governor of Fiji, whose death was announced early in February, had been a member of our Society for the last twelve years. His connection with Fiji dated from 1866, when, at the age of thirty, after serving for some years in the mercantile service, he entered the British consulate in those islands. In 1869 he became Acting Consul, and before the annexation of the group by Great Britain in 1874, the chief control of the affairs of the islands had fallen into his hands. Mr. Thurston served with ability and success under Sir Arthur Gordon (now Lord Stanmore), the first High Commissioner for the Western Pacific, and was himself promoted to that post in 1887, having in 1885 acted as British Commissioner in the negotiations with Germany concerning the affairs of the Pacific Islands. In 1883 he had married a daughter of Mr. John Berry, of New South Wales.

Admiral Sir Alexander Milne, G.C.B.

We regret to have to record the death of Admiral of the Fleet Sir Alexander Milne, G.C.B., who had been a Fellow of our Society since 1866, and who succumbed to pneumonia resulting from a chill at the end of December last, at the age of ninety years. The second son of Admiral Sir David Milne, who distinguished himself in many actions with the French at the beginning of the century, our late associate entered the navy at an early age, and, after serving on various foreign stations, became commander in 1830. From 1836 to 1841 he was engaged partly in the repression of the slave-trade in the West Indies, and partly in the protection of the fisheries off Newfoundland and Labrador, becoming captain in 1839. After serving for some years in home waters, and after holding the post of Junior Lord of the Admiralty from 1847 to 1859, he became Commander-in-Chief on the North-American station in 1860, and helped to improve the relations between this country and the United States by the tact which he displayed during a visit to New York

with his ships in 1863. Between 1865 and 1876 he was twice Senior Naval Lord of the Admiralty, with an interval of service as Commander-in-Chief of the Mediterranean and Channel Squadrons. After the close of his professional career, he did good work as a member of various committees, especially with reference to questions of colonial defence, and in 1890-91 took an active interest in the Naval Exhibition. Between 1876 and 1881 he had served as Vice-President and Member of Council of our Society.

John Lowe Nicholl.

The death has been announced of Mr. John Lowe Nicholl, one of the pioneers of British enterprise in Nyasaland, where he had spent more than fifteen years. Originally a member of the Blantyre Mission, he subsequently served eight years with the African Lakes Company, and whilst so engaged convoyed the loads of the London Missionary Society's steamer *Good News* to Lake Tanganyika (1884-87). He fought all through the Arab war in North Nyasaland (1887-89), frequently saving the situation by bringing up native levies. In 1889-90 he accompanied Sir Harry Johnston on his journey between Lakes Nyasa and Tanganyika, and in the latter year founded the important station of Abercorn, at the south end of Tanganyika, for the African Lakes Company. In 1892 he entered the service of the British Central Africa Protectorate, and was for some years Collector for the South Nyasa district, and since 1894 Vice-Consul for South Nyasa. Although of small stature and apparently of weak physical organization, he was a man of remarkable courage. He was possessed of considerable erudition, and was universally esteemed by those with whom he came in contact. Among the natives he was a great favourite. His death is much regretted by all the Europeans in British Central Africa. He became a Fellow of our Society in 1891.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1896-1897.

Afternoon Technical Meeting, Tuesday, January 19, 1897.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

The Paper read was:—

"On Sand Dunes." By Vaughan Cornish.

Fifth Ordinary Meeting, January 25, 1897.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—Furset G. Arboin; C. A. Montague Barlow, Barrister-at-Law; T. J. Barnardo, F.R.C.S.N.; Carsten E. Borchgrevink; Samuel Baxter Boulton, J.P.; William Stewart Russell Brock; George Archibald Charles Brown; Edward Chaplin; George William Forrest, B.A. (Oxforb.); Thomas Edward Hardy; Albert Frederick Alonzo Howe, L.D.S., R.C.S. Eng.; Francis Wingfield King; Robert Trefusis Mallet, C.E., M. Inst. C.E.; Walter John Mathams; Newman M. Oyle; John Paton; Robert Watson Purves; John Ramford Slack, B.A.; Henry George Slade; Sir Charles Strickland, Bart.

The Paper read was:—

"An Expedition across Spitzbergen." By Sir W. Martin Conway.

Sixth Ordinary Meeting, February 3, 1897.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Thomas Batson; Charles William Bell; John Browne; Frederick Gurnett Clarke; W. Luther Croll; Edward Rees Davies; D. N. Dhar; Edward Price Blackwood Holloway; I. Hardy; Roger Lloyd Kennion; James Patrick Leslie; Henry Moncrieff Paul; Captain Ricardo D. Petrie, R.E.; George Edward Price; Edwin Benjamin Raymond; Thomas Slingsby Tanner; Augustus George Wildy; Glenne Harrington Leard Williams.*

The Paper read was:—

"An Expedition across the North Polar Area." By Dr. Fridtjof Nansen.

Afternoon Technical Meeting, Thursday, February 13, at 5 p.m.—General R. STRACHEY, R.N., C.S.I., etc., Vice-President, in the chair.

The Paper read was:—

"The Teaching of Geography in Relation to History." By A. W. Andrews.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., Librarian, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Académie, Akademie.
Ann. = Annales, Annalen, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
O. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.

Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selakab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words octavo, quarto, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 x 6½.

EUROPE.

Alps. *Annuaire Club Alpin Français* 22, 1895 (1896): 465-484. Girod.
Les anciens glaciers et les alpinistes préhistoriques. Par M. le Dr. Paul Girod.
On the remains of primitive man at considerable elevations in the Alps.

Alps. *Lanthérie.*
L'Homme devant les Alpes. Par Charles Lanthérie. Paris: E. Plon, Nourrit et Cie, 1896. Size 9 x 6, pp. 12 and 180. Maps.

This book deals with prehistoric man, the migrations of early peoples, the subdivisions of the Alps, their origin, and the whole history of trans-Alpine paths, roads, and railways. The map given as a frontispiece is traced from a pre-Victorian original, showing the great range across Africa in 6° N., and other curious relics of the past.

Alps. *Deutsche Rundschau* G. 19 (1896-97): 101-100, 153-159. Mader.
Aus den Ligurischen Alpen. Von Fritz Mader. With illustrations.

Alps. *Z. Deutsch. u. Oesterr. Alpenvereins* 27 (1896): 62-88. **Ratzel.**

Die Alpen inmitten der geschichtlichen Bewegungen. Von Prof. Dr. Friedr. Ratzel.

Austria—Bohemia. **Ruvarc and Penck.**

Die Abfluss- und Niederschlagsverhältnisse von Böhmen von Dr. Vaso Ruvarc nebst Untersuchungen über Ventilation und Abfluss von grösseren Landflächen von Prof. Dr. Albrecht Penck—Geographische Abhandlungen. Herausgegeben von Prof. Dr. Albrecht Penck in Wien. Band V. Heft 5. Wien: E. Hölzel, 1896. Size 11 x 7½, pp. [50]. *Maps and Plates. Presented by Prof. Dr. A. Penck.*

Dr. Ruvarc's paper is illustrated by a rainfall map of Bohemia. Both papers deal with the question of the relation between rainfall and evaporation.

Austria—Salzkammergut. **Müllner.**

Die Seen des Salzkammergutes und die österreichische Traun. Erläuterungen zur ersten Lieferung des österreichischen Seenatlases. Von Dr. Johann Müllner.—Geographische Abhandlungen. Herausgegeben von Prof. Dr. Albrecht Penck in Wien. Band VI. Heft 1. Wien: E. Hölzel, 1896. Size 11 x 7½, pp. 116. *Plates. Presented by Prof. Dr. A. Penck.*

France—Arcachon. **Duffart.**

Le Bassin d'Arcachon.—Géographie rétrospective du Bassin.—Projets et essais d'amélioration des passes depuis un siècle.—État actuel. Par M. Ch. Duffart.—Congrès National des Sociétés Françaises de Géographie. 16^e Session. Bordeaux, Août 1895. *Compte Rendu.* Bordeaux, 1896. Size 10 x 6½, pp. 153-167.

France—Arcachon. **Hautreaux.**

Côtes des Landes et bassin d'Arcachon: les vants, les courants, les températures et les densités de la mer. Par M. Hautreaux.—Congrès National des Sociétés Françaises de Géographie. 16^e Session. Bordeaux, Août 1895. *Compte Rendu.* Bordeaux, 1896. Size 10 x 6½, pp. 251-298. *Diagrams.*

France—Birth-rate. *Rev. Scientifique* (4) 7 (1897): 97-105. **Lévaiseur.**
La natalité en France. Par M. E. Lévaiseur.

France—Gironde. **Fallot.**

La Carte géologique des environs de Bordeaux et les Régions naturelles de la Gironde. Par M. E. Fallot.—Congrès National des Sociétés Françaises de Géographie. 16^e Session. Bordeaux, Août 1895. *Comptes Rendu.* Bordeaux, 1896. Size 10 x 6½, pp. 27-31.

France—Jura. *Annuaire Club Alpin Français* 22, 1895 (1896): 147-170. **Renaud.**

Le Jura scottornain: troisième campagne, 1895 (la source du Lançot; la grotte du Puits-Billard; la source de l'Ain, la grotte des Nans ou source de l'Angillon, la source du lac de Chalin; la caverne du Bief l'Euragé, la grotte de Jeurre, la source de la Grasse). Par M. Edmond Renaud. *With Plans and Illustrations.*

France—Malville. *B.S.G. Com. Saint-Nazaire* 13 (1896): 15-28. **Louvel.**
Monographie de la commune de Malville. Par M. Louvel.

France—Mont Blanc. **Durier and Schrader.**

Annuaire Club Alpin Français 22, 1895 (1896): 3-45.
Sur les routes du Mont-Blanc: 1^{re} L'arête des Boasses. Par M. Ch. Durier; 2^e Un tourment au Mont-Blanc, 1891. Par M. F. Schrader. *With Illustrations.*

France—Pas-de-Calais

Mayville, an Anglo-French Pleasure-ground: its attractions and aims. Illustrations by Phil May. London: T. Fisher-Unwin, [not dated]. Size 10 x 7½, pp. 60. *Map, Plan, and Illustrations. Price 2s. 6d. Presented by La Compagnie de Mayville.*

Mayville does not yet exist; but the company which has been formed to create it have prepared this little book describing the site of the proposed watering-place, a short distance south of Boulogne.

France—Pyrenees. **Guesot.**

Des effets du déboisement dans les Pyrénées. Par M. Guesot.—Congrès National des Sociétés Françaises de Géographie. 16^e Session. Bordeaux, Août 1895. *Compte Rendu.* Bordeaux, 1896. Size 10 x 6½, pp. 182-200.

France—Pyrenees. *Annuaire Club Alpin Français* 22, 1895 (1896): 104-145. **Belloc.**

Un plateau de Lannurizan au glacier des Gorges-Blanches (Hautes-Pyrénées) Par M. Emile Belloc. *With Illustrations.*

- France—Vosges.** *C.Rd.* 124 (1897): 51-54. **Lapparent.**
 Sur l'histoire géologique des Vosges. Note de M. A. de Lapparent.
- Germany—Bavaria.** *Mouvement G.* 13 (1896): 589-593. **Wantera.**
 Ethnétique des villes. Rothenburg. *With Illustrations.*
 An account of a "newly discovered" mediæval town in Bavaria, with pictures of the quaint architecture.
- Germany—Brandenburg.** *Z. Ges. Erdk. Berlin* 31 (1896): 98-105. **Dinse.**
 Ein schwedischer Kartograph der Mark Brandenburg aus der Zeit des dreissig-jährigen Krieges. Von Dr. Paul Dinse.
- Germany—Memel.** *Deutsche Rundschau G.* 19 (1897): 145-153. **Zweck.**
 Die Stadt Memel und ihre Wasserstrassen nach dem Binnenlande. Von Dr. A. Zweck. *With Map and Illustrations.*
- Germany—Saale.** *Naturw. Wochenschrift* 12 (1897): 4-7. **Ule.**
 Der Wasserhaushalt im Stromgebiet der thüringischen Saale. Von Dr. Willi Ule.
- Hungary.** *B.S.G. Lyon* 14 (1897): 99-136. **Groffier.**
 La Hongrie pittoresque et économique. Par M. Valérian Groffier.
- Hungary—Transylvania.** *Deutsche G. Blätter* 19 (1896): 194-206. **Brass.**
 Im Siebenbürgisch-ungarischen Grenzgebirge. Von Dr. Martin Brass.
- Iceland.** *Annuaire Club Alpin Français* 22, 1895 (1896): 287-319. **Eichmüller.**
 La région du Myvatn en Islande. Par M. Georges Eichmüller. *With Map and Illustrations.*
 Contains some fine photographs of scenery in the north of Iceland.
- Iceland—Earthquake.** *Globe* 70 (1896): 309-311. **Gebhardt.**
 Das Erdbeben auf Island am 26/27 August und 5/6 September 1896. Von Dr. Phil. August Gebhardt. *With Map.*
 An account of an earthquake in the neighbourhood of Reykjavik, with a map of the district affected.
- Italy—Islands.** *Riv. G. Italiana* 3 (1896): 563-568. **Meri.**
 L'area delle minori isole italiane. Notizia di Attilio Meri.
- Italy—Sicily.** *Globe* 71 (1897): 69-71. **Deecke.**
 Ueber die sicilischen Schlammtvulkane. Von W. Deecke. Greifswald.
- Italy—Vesuvius.** *Annuaire Club Alpin Français* 22, 1895 (1896): 401-464. **Durier.**
 Le Vésuve et Capri. Par M. Ch. Durier. *With Illustrations.*
- Mediterranean—Crete.** *B.S.R. Belge G.* 20 (1896): 433-452. **Hautteccour.**
 La Crète. Par Henry Hautteccour.
- Norway.** *Z. Deutsch. u. Oesterr. Alpenvereins* 27 (1896): 1-93. **Richter.**
 Aus Norwegen. Von E. Richter. *With Illustrations.*
- Russia—Caucasus—Salmon.** **Kawraisky.**
 Die Lachse der Kaukasusländer und ihrer angrenzenden Meere. Von F. F. Kawraisky. 1st Lieferung. Tiflis, 1896. Size 104 x 7. pp. 92. *Plates.* (In Russian and German.)
- Russia—Kiev.** **Baye.**
 Kiev, la Mère des Villes Russes. Par le Baron de Baye. Paris: Nilsson, 1896. Size 10 x 6½. pp. 48. *Illustrations.*
 A fresh and lively account of the visit of a French tourist to Kiev, with references to the history and antiquities of that famous city.
- Russia—Libau.** *P.I. Civil Engineers* 126 (1896): 360-374. **Jarintzoff.**
 On the construction of the Military Outport at Libau. By Dmitri Theodor Jarintzoff. *With Map and Plans.*
- Scandinavia.** **Rabot.**
 Les limites d'altitude des cultures et des essences forestières dans la Scandinavie septentrionale et les régions adjacentes. Par M. Charles Rabot. Extrait de la Revue Générale de Botanique. Tome viii. (1896), p. 385. Paris: P. Dupont, 1896. Size 10 x 6½. pp. 34. *Diagram.*
 On the limits in altitude of various plants and crops in Northern Europe.

- Slavonic Ethnography.** *Globus* 71 (1897): 11, 12. **Rhamm.**
Die Fortschritte der tschecho-slawischen Ethnographie. Von Karl Rhamm.
- Switzerland—Jura.** *Annuaire Club Alpin Français* 22, 1895 (1896): 210-242. **Coënot.**
Autour de Sainte-Croix (Jura Suisse). Par M. Henry Coënot. *With Illustrations.*
- Switzerland—Rhône.** *C.Rd.* 124 (1897): 106-109. **Lugeon.**
Le Rhône suisse tributaire du Rhin. Note de M. Maurice Lugeon.
Arguments to prove that the Rhone in Switzerland was in pliocene times a tributary of the Rhine, from which it was diverted and "captured" by a series of changes due to glaciation and Earth-movement as well as to river erosion.
- United Kingdom—England.** *P.I. Civil Engineers* 126 (1896): 2-23. **Hill.**
The Thirlmere Works for the Water-Supply of Manchester. By George Henry Hill. *With Plates.*
- United Kingdom—England.** *Quarterly Rev.* 185 (1897): 117-148. ———
Norfolk.
- United Kingdom—England.** **Ward.**
Thorough Guide Series. Surrey and Sussex [including Tunbridge Wells]. By C. S. Ward, M.A. *Nineteen Maps and Plans, by Bartholomew.* London: Dulau & Co., 1887. Size 6½ x 4½, p. xli. and 172. Price 3s. 6d. *Presented by the Publishers.*
This guide, like others of the series, is plentifully supplied with excellent maps, and the information it contains is carefully selected and revised.
- United Kingdom—Ireland.** *Nature* 55 (1897): 254-256. **Cole.**
The Bog-Slide of Knocknageeha, in the County of Kerry. By Prof. Grenville A. J. Cole. *With Sketch-Map and Illustration.*
- United Kingdom—Scottish Lochs.** *Scottish G. Mag.* 13 (1897): 1-21. **Murray.**
Some Observations on the Temperature of the Water of the Scottish Fresh-Water Lochs. By John Murray, M.Sc. *With Diagrams.*
These observations were made in Loch Lochy (fresh water) and Loch Etive (sea-water), and in some smaller fresh-water lochs. The data are printed together with a general discussion.
- United Kingdom—Wales.** *P.I. Civil Engineers* 126 (1896): 24-125. **Deacon.**
The Vyrnwy Works for the Water-Supply of Liverpool. By George Frederick Deacon. *With Plates.*
An account of the creation of an artificial lake on the site of a post-glacial lake-basin, which, from the borings of the engineers, seems to be a true rock-basin filled with alluvium. The reservoir is enclosed by a dam of masonry founded on solid rock.

ASIA.

- Asia-Minor.** **Sarre.**
Reise in Kleinasien, Sommer 1895. Forschungen zur alttürkischen Kunst und Geographie des Landes. Von Friedrich Sarre. Berlin: D. Reimer, 1896. Size 10½ x 7½, pp. xvi. and 210. *Maps and Illustrations.* Price 16s.
Dr. Sarre traversed Asia-Minor from west to east, nearly along the thirty-eighth parallel, through the ancient provinces of Phrygia, Lycaonia, and Pisidia in June and July, 1895. The main object of the journey was the study of early Turkish architecture of the thirteenth century. There are many fine views of natural scenery as well as of architecture.
- Asia-Minor—Hierapolis.** **Joanne.**
Annuaire Club Alpin Français 22, 1895 (1896): 320-338.
Une ascension en Asie-Minore: Hierapolis et sa cascade pétrifiée. Par M. Paul Joanne. *With Illustrations.*
- Asia-Minor—Karia.** **Paton and Myres.**
Researches in Karia. By W. R. Paton and J. L. Myres. *From the Geographical Journal* for January, 1897. Size 10 x 6½, pp. 18. *Maps and Illustrations.*
- Baluchistan—Kalat.** **Tate.**
Government of India. Foreign Department. Kalat. A Memoir on the Country and Family of the Ahmadzai Khans of Kalat. (In two Parts.) From a Manuscript Account by the Akhund Muhammad Shik, with Notes and Appendices from other Manuscripts, as well as from Printed Books. By Geo. P. Tate. Calcutta, 1896. Size 13½ x 8½, pp. ii, 56, and xii. *Presented by the Author.*

Ceylon.

The Ruined Cities of Ceylon. By Henry W. Cave, M.A. Illustrated with Photographs taken by the Author in the year 1896. London: Low & Co., 1897. Size $11\frac{1}{2} \times 9$, pp. 126. Price 38s. Presented by the Publishers.
This beautiful book will be specially noticed.

China.

A travers le Monde, Tour du Monde (n.s.) 3 (1897): 9-12.
Mission commerciale lyonnaise en Chine. De Yun-Nan-Fou vers le Se-Tchouen. With Illustrations.

China.

Les origines de deux établissements Français dans l'Extrême Orient—Chang-hai—Ning-po. Documents inédits publiés avec une Introduction et des Notes par Henri Cordier. Paris; 1896. Size $11 \times 7\frac{1}{2}$, pp. x1. and 76. Plan and Plate.

China.

Riv. G. Italiana 3 (1896): 545-558.
Gli interessi italiani nella Cina del Prof. Lodovico Nocentini.

Chinese Empire—Lob Nor.

Z. Ges. Erdk. Berlin 31 (1896): 295-361.
Dr. Sven Hedin's Forschungsreise nach dem Lop-nor, Januar bis Mai 1896. With Maps.

Bemerkungen zur Kenntnis des Lop-nor-Gebietes und zur geographischen Nomenclatur in Central-Asien. Von Dr. Sven Hedin.

French Indo-China.

B.S.G. Paris (7) 17 (1896): 302-398.
La voie ferrée de Bassac à Saigon. Par Paul d'Enjoy. With Map.

India.

G. V. Juggarow Observatory, Daba Gardens, Vizagapatam, maintained by Mrs. A. A. Narsingrow. Results of Meteorological Observations, 1894. Vizagapatam, 1896. Size 8×5 , pp. vi. and 132. Diagrams.

India—Bombay Observations.

Magnetical and Meteorological Observations at the Government Observatory, Bombay, 1895, made, reduced, and tabulated under the direction of Charles Chambers, and N. A. F. Moos, M.A. With an Appendix. Bombay, 1896. Size 14×10 , pp. 6, xvi., 10, 12, and 10.

India—Burma.

Diary of Second Lieutenant E. S. Carey, 2nd Royal Inniskilling Fusiliers, Intelligence Officer, Jade Mines Escort. Rangoon, 1896. Size $13 \times 8\frac{1}{2}$, pp. [26]. Maps. Presented by the Quartermaster-General in India.

India—Burma.

Report on the Internal Trade of Burma for the Three Years ending the 31st March, 1896. Rangoon, 1896. Size $13 \times 8\frac{1}{2}$, pp. 8 and lxxviii. Map.

India—Burma.

Report on the Thetta Column and Work in the Southern Chin Hills during the season 1894-95. By Captain John Harvey, M.A. Rangoon, 1895. Size $13\frac{1}{2} \times 9$, pp. 16, 8, 6, and 6. Maps. Presented by the Quartermaster-General in India.

India—Burma.

Report on a Tour through the Northern Shan States. By Lieut. G. C. Rigby. Season 1894-95. Rangoon, 1895. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 28 and lxxi. Maps and Illustrations. Presented by the Quartermaster-General in India.

India—Burma.

Report on the Kairuma, Naring, and Daidin Columns, Chin Hills, 1895-96. By Lieut. C. H. Turner. Rangoon, 1896. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 20, 6, 2, 4, 6, 2, 2. Maps and Illustrations. Presented by the Quartermaster-General in India.

India—Burma.

Report on the Sasa Kachin Expedition, 1895-96. By Lieut. M. N. Turner. Rangoon, 1896. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 22, 4, 8, 2, 2, 4, 4, 4. Maps and Illustrations. Presented by the Quartermaster-General in India.

Kafiristan.

The Kafiristan and the Kaffri Tribes. By Major H. G. Raverty. Reprinted from the *Calcutta Review* for July, 1896. Size $9 \times 5\frac{1}{2}$, pp. 46. Presented by the Author.

Kafiristan.

Osterr. Monatschr. Orient. 22 (1896): 129-132.

Kafiristan und die Kaffren. Von H. Vambery.

An appreciation of Sir George Robertson's book in Prof. Vambery's characteristically entertaining style.

Malay Archipelago—Borneo.**Kühr.***Bijdr. Taal-, Land- en Volkenk. Ned.-Indië* (6) 3 (1897): 57-82.Schetsen uit Borneo's Westerafdeeling. Door E. L. M. Kühr. *With Illustration.***Malay Archipelago—Celebes.****Sarasin.***A travers le Monde, Tour du Monde (n.s.)* 3 (1897): 33-36.Exploration de Célèbes. Par P. and F. Sarasin. *With Illustrations.***Malay Archipelago—Java.****Van der Kemp.***Bijdr. Taal-, Land- en Volkenk. Ned.-Indië* (6) 3 (1897): 1-48.

De economische oorzaken van den Java-oorlog van 1823-30. Door P. H. van der Kemp.

Palestine. Palestine Exploration Fund, Quarterly Statement (1897): 44-53. **Chaplin.**

The visit of David the Benbenite to Hebron and Jerusalem in A.D. 1523. By Thomas Chaplin, M.A.

This short account of the visit of David the Benbenite to Hebron is followed by a "Note on the Hebron Haram," by Canon Dalton.

Palestine.**Smith.**The Historical Geography of the Holy Land, especially in relation to the history of Israel and of the Early Church. By George Adam Smith, D.D. With six maps. Seventh Thousand, with Additions, Corrections, and New Index of Scripture References. London: Hodder and Stoughton, 1897. Size 9½ x 6, pp. xxvi, and 714. Price 15s. *Presented by the Publishers.*This new edition retains all the excellent features of the first edition, reviewed at length in the *Journal*, vol. iv. (1894), p. 450; it also embodies the results of recent Palestine research, and contains additional indexes and notes of great value.**Persia.****Houtum-Schindler.**Eastern Persia and Irak. By General A. Houtum-Schindler. London: John Murray, 1896. Size 8½ x 5½, pp. viii, and 192. *Map.*

One of the additional publications of the Royal Geographical Society.

Persia—Meshed.*Globe* 70 (1896): 315-321, 334-338.**Minkevitch.**

Reise nach Meshed in Persien. Von Dr. Georg Minkevitch.

The author travelled from Ashkhabad to Meshed in company with an interpreter. He gives a general description of the journey and of the town.

Russia—Caucasus. Annuaire Club Alpín Français 22, 1895 (1896): 330-359. **Gallois.**La traversée du Caucase par la route de Géorgie (de Tiflis à Vladikavkaz); de Tiflis à Erivan; le mont Ararat. Par M. Eugène Gallois. *With Map and Illustrations.***Russia—Transcaucasia.****Bryce.**Transcaucasia and Ararat: being Notes of a Vacation Tour in the Autumn of 1876. By James Bryce. Fourth Edition Revised, with a Supplementary Chapter on the Recent History of the Armenian Question. London: Macmillan & Co., 1896. Size 8 x 6, pp. xx, and 526. *Map. Price 8s. 6d.*

This edition of this standard work contains a series of footnotes, bringing the description of the province of Transcaucasia up to date, while a new chapter is added on the present aspect of the Armenian question.

Russia—Siberia. Mem. A. Imp. Sci. St. Petersburg (S) 2 (1895): 1-26. **Stalling.**

Magnetische Beobachtungen auf einer Reise nach Urga im Sommer 1893 nebst Bemerkungen über die Änderungen der erdmagnetischen Elemente in Ost-Sibirien. Von Ed. Stalling.

Russian Seal Islands.**Stejneger.**

U.S. Commission of Fish and Fisheries, John J. Brice, Commissioner. The Russian Fur-Seal Islands. By Leonhard Stejneger. Extracted from U. S. Fish Commission Bulletin for 1896. Art. 1, pp. 1-118, plates 1-66. Washington, 1896. Size 11½ x 8.

This fully illustrated memoir will be specially referred to.

Syria.**Heber-Percy.**Mush, Ammon, and Gilad. By Algernon Heber-Percy. Market Drayton: Ben- nion, Horne, Smallman & Co., 1896. Size 9 x 6, pp. viii, and 102. *Map and Illustrations. Presented by the Publishers.*

An unassuming account of an interesting journey east of the Dead sea, from Medeba to the river Arnon to the south to Mezariah, east of the Sea of Galilee, in the north. The illustrations of Arabes and ruins are all good.

AFRICA.

Africa.

Hawwood.

Geography of Africa. By Edward Hawwood, M.A. London: Macmillan & Co., 1896. Size 7 x 5, pp. xii. and 262. *Map and Illustrations.* Price 2s. 6d. *Presented by the Publishers.*

A special note will be given on this book.

Africa—French Explorations. *Rev. Française* 22 (1897): 5-17.

Mannoir.

Les explorations françaises en Afrique en 1896. Par Ch. Mannoir. *With Map.*

French explorations in the Sahara (with a sketch-map of M. Pourreau's journey), in the Sudan and in Central Africa during 1896, form the subject of this short article.

Central Africa. *J.R. Colonial* I. 28 (1897): 94-119.

Johnston.

England's Work in Central Africa. By Sir Harry H. Johnston, K.C.S.I.

Congo State.

Hinde.

The Fall of the Congo Arabs. By Sidney Langford Hinde. London: Methuen & Co., 1897. Size 9 x 6, pp. viii. and 308. *Map and Portrait.* Price 12s. 6d. *Presented by the Author. Another copy presented by the Publisher.*

This will be specially noticed.

Egypt.

Fensa.

L'Égypte au point de vue économique et les intérêts français. Par M. Henri Fensa.—Congrès National des Sociétés Françaises de Géographie, 16^e Session, Bordeaux, Août 1895. *Compte Rendu.* Bordeaux, 1896. Size 10 x 6½, pp. 227-236.

French West Africa. *A travers le Monde, Tour du Monde (n.s.)* 3 (1897): 17-90.

Le Chemin de fer du Sénégal au Niger. *With Illustrations and Map.*

French West Africa—Dahomey.

Martin.

Mis Cellulaires 28 (1896): 502-504, 569-569, 581-584, 593-597.

A travers le Dahomey. Par le R. P. Martin. *With Illustrations.*

French West Africa—Dahomey.

Pié.

A travers le Monde, Tour du Monde (n.s.) 3 (1897): 1-4.

Une Délimitation de Frontière au Dahomey. Notes sur l'importante mission du capitaine Pié. *With Map and Illustrations.*

German East Africa.

Stuhlmann and Schlobach.

M. Deutsch. Schutzgeb. 9 (1896): 247-249.

Die Höhenmessungen Dr. Stuhlmanns während drei Reisen in dem Jahre 1894 in Usambara, Ukami, Uguru u. s. w., und von Premier-Lieutenant Schlobach in den Jahren 1894-95 in den gleichen Gebieten.

German East Africa—Wahaha. *Verh. Ges. Ethn. Berlin* 23 (1896): 467-492.

Wenke.

Herr Dr. K. Wenke: Die Wahaha.

German East Africa—Usambara.

Buschwald.

M. Deutsch. Schutzgeb. 9 (1896): 213-223.

Beitrag zur Gliederung der Vegetation von West-Usambara. Von Dr. phil. Johannes Buschwald.

German South-West Africa. *Globus* 71 (1897): 94, 95.

Brincker.

Beschreibung der "Éumbo" des Häuptlings der ovaknjanama in Nord-Ovambo-land. Von P. H. Brincker. *With Illustration.*

A plan of the residence of an Ovambo chief, showing the remarkable labyrinthine passages by which the entrances are guarded.

German South-West Africa—Cusena. *M. Deutsch. Schutzgeb.* 9 (1896): 999-219.

Esmer.

Ueber das Gebiet an der Kuneneimündung. Von Dr. jur. Esmer. *With Map.*

German West Africa—Togo. *M. Deutsch. Schutzgeb.* 9 (1896): 189-208.

Klose.

Bericht über eine Reise von der Station Misahöhe über Keta und Kratyl nach Salaga Ende des Jahres, 1894. Von H. Klose.

Niger.

Rev. Scientifique (4) 7 (1897): 108-110.

Hourst.

La Mission hydrographique du Niger. Par M. Hourst.

Réunion.

Rev. Française 22 (1897): 18-23.

O'Zouz.

La population de la Réunion. Par L. O'Zouz.

- Somaliland.** *Globus* 70 (1896): 331-333, 349-352. **Keller.**
Reisetradition in den Somaliländern. Von Prof. Dr. C. Keller. Zürich. V.
 A description of the Somali people and their mode of life.
- Somaliland—Magadoxo.**
A travers le Monde, Tour du Monde (n.s.) 3 (1897): 29-30.
Le Massacre de la mission Cocchi. With Illustration and Portrait.
- South Africa—Barotse Country.** **Bertrand.**
A travers le Monde, Tour du Monde (n.s.) 3 (1897): 25-28.
Une Expédition au Pays des Barotse. Par M. Alfred Bertrand. With Illustrations.
- South Africa.** *Deutsche G. Blätter* 19 (1896): 200-215. **Sonnenswald.**
Südafrikanische Tierseuchen mit besonderer Berücksichtigung der Rinderpest in ihrer geographischen Bedeutung. Von Tierarzt A. Sonnenswald.
- Transvaal.** *Verh. Ges. Erdk. Berlin* 23 (1896): 492-507. **Passarge.**
 Herr Dr. S. Passarge über seine Reisen in Transvaal.
- Tunis and Algeria.** *Annuaire Club Alpin Français* 22, 1895 (1896): 243-256. **Bouchard.**
Voyage en Tunisie et en Algérie, organisé par la Section des Hautes Vosges.
 Par M^{re} Paul Bouchard. With Illustrations.
- West Africa.** *B.S.G. Paris* (7) 17 (1896): 337-363. **Cuny.**
De Libreville au Cameroun. Par C. Cuny. With Map.
- West Africa.** **Kingsley.**
Travels in West Africa, Congo Français, Corisco and Cameroons. By Mary H. Kingsley. London: Macmillan & Co., 1897. Size 9½ x 6, pp. xvi. and 744. Illustrations. Price 21s. Presented by the Publishers.
 This book is specially noticed in the Monthly Record.

NORTH AMERICA.

- America—Anthropology.** **Fronse.**
 Dr. Konrad Theodor Fronse. Menschenopfer und Selbstverstümmelung bei der Teichtentration in Amerika. Eine Darstellung der Natur des Gewissens vermittelt der vergleichenden Völkerpsychologie. (Sonder-Abdruck aus der *Indian-Festschrift*.) Berlin: D. Reimer, 1896. Size 11 x 7½, pp. 36. Presented by the Author.
- Canada—Barren Grounds.** **Whitney.**
On Snow-Shoes to the Barren Grounds. Twenty-eight Hundred Miles after Musk-Oxen and Wood-Bison. By Caspar Whitney. London: Osgood, McIlvaine & Co., 1896. Size 9½ x 6½, pp. x. and 324. Illustrations. Price 16s.
 A well-told and illustrated narrative of a sporting trip due north of Great Slave Lake, nearly to the Arctic sea.
- Canada—British Columbia.** *Trans. R.S. Canada* (2) 1 (1895): 103-122. **Hill-Tout.**
Later Prehistoric Man in British Columbia. By Charles Hill-Tout. With Illustrations.
- Canada—Historical.** *Trans. R.S. Canada* (2) 1 (1895): 23-61. **Gosselin.**
Les Jésuites au Canada. Le P. de Bonaventure, dernier professeur d'hydrographie au collège de Québec, avant la conquête (1741-1759). Par M. l'abbé Auguste Gosselin.
- Canada—New Brunswick.** *Trans. R.S. Canada* (2) 1 (1895): 91-102. **Ganong.**
A Plan for a General History of the Province of New Brunswick. By William F. Ganong.
 A complete table of contents for a projected history of New Brunswick.
- Canada—Nova Scotia.** *Trans. R.S. Canada* (2) 1 (1895): 51-90. **Brynmur.**
The Jamaica Maroons—How they came to Nova Scotia—How they left it. By D. Brynmur, LL.D.
- Great American Lakes.** *Globus* 71 (1897): 8-11. **Greim.**
Die Entstehung der nordamerikanischen grossen Seen. Von Dr. G. Greim. With Maps.
- Labrador.** *Deutsche Rundschau G.* 10 (1897): 164-170. **Bach.**
Labrador. Reisekizze von Rudolf Bach in Montreal. With Illustrations.

North America. *American Naturalist* 30 (1896): 886-902, 1063-1026. **Cope.**
The Geographical Distribution of Batrachia and Reptilia in North America. By E. D. Cope.

United States. *Science (n.s.)* 5 (1897): 1-15, 42-51. **Emmons.**
The Geology of Government Explorations. By S. F. Emmons.

The articles are of equal interest to geographers and geologists, as topographical and geological surveys in the United States have always gone on together.

United States—Alaska. **Reid.**
Glacier Bay and its Glaciers. By H. F. Reid. In the *Sixteenth Annual Report of the United States Geological Survey, 1894-95*, part I. pp. 421-468. *Maps and Illustrations.*

A study of the glaciers and the glacial geology of Glacier bay, with a number of maps and fine photographs.

United States—California. *J. Geology* 4 (1896): 881-896. **Lindgren and Knowlton.**
The Age of the Auriferous Gravels of the Sierra Nevada. By Waldemar Lindgren. With a Report on the Flora of Independence Hill. By F. H. Knowlton. *With Map.*

United States—Geological Survey Report.

Sixteenth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1894-95. Charles D. Walcott, Director. In Four Parts. Part I. Director's Report and Papers of a Theoretic nature; Part II. Papers of an Economic Character; Part III. Mineral Resources of the United States, 1894—Metallic Products; Part IV. Ditto—Nonmetallic Products. Washington, 1895-96. Size 12 x 5½, pp. (part I.) xxii, and 919, (part II.) xx, and 598, (part III.) xiv, and 646, (part IV.) xviii, and 796. *Maps and Plates.* Presented by the Survey.

United States—Survey. **Gannet.**
Summary of primary triangulations executed between the years 1882 and 1894. By Henry Gannet. Methods and instruments employed, and areas covered, in the *Sixteenth Annual Report of the United States Geological Survey for 1894-95*. Part I. pp. 877-885. *Map.*

The map shows the state and progress of the survey for the year 1894-95.

CENTRAL AND SOUTH AMERICA.

Argentine Andes. *Z. Deutsch. u. Oesterr. Alpenvereins* 27 (1896): 36-61. **Habel.**
Aus den argentinischen Anden. Von Jan Habel. *With Illustrations.*

Boilvior—Beni. *Deutsche Rundschau* 7. 19 (1896): 115-125. **Nusser—Asport.**
Der Rio Beni von seinen Quellen bis zu seiner Mündung. Von Chr. Nusser-Asport.

Brazil—Bahia. *Rev. Trim. I.G. e Hist. Bahia* 3 (1896): 305-312. **Oliveira.**
A Zona Austral da Bahia. Dr. Sô Oliveira.

Brazil—Bahia and Espirito-Santo.
Rev. Trim. I.G. e Hist. Bahia 3 (1896): 313-327.

Estudos sobre os Limites entre os Estados da Bahia e Espirito-Santo.

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Risorse naturali del Pinahy. (Brasile Settentrionale.) Avv. Giuseppe Reminolfi.

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Question du Contesté Franco-Brésilien. Par M. V. Doby.—Congrès National des Sociétés Françaises de Géographie, 18^e Session, Bordeaux, Août 1895. Compte Rendu. Bordeaux, 1896. Size 10 x 6½, pp. 282-293.

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Geology of Chiapas, Tabasco and the Peninsula of Yucatan. By Carlos Sapper. Translated by C. Jouquins Maury and G. D. Harris. *With Map.*

Colombia. *Naturales. Wochenschrift* 12 (1897): 1-4, 37-39. **Regel.**
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Prof. Regel writes from Medellin, giving an account of his journey from Bremen, and including a series of air and sea-temperatures taken twice daily between Havre and St. Thomas, West Indies.

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Report on the Navigability of the Eastern Rivers of Peru. By Captain M. Meliton Carvajal, of the Peruvian Navy. Lima, 1896. Size $8\frac{1}{2} \times 6$, pp. 12. *Map.*

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Karten zur physikalischen Geographie von Venezuela. Von Prof. Dr. W. Sievers. *With Map.*

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Brief submitted by Venezuela to the Commission appointed "to investigate and report upon the true Divisional Line between the Republic of Venezuela and British Guiana." Size $9\frac{1}{2} \times 6$, pp. 28.

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Documents and Maps on the Boundary Question between Venezuela and British Guayana from the Capuchin Archives in Rome, with a brief summary of the Question, by the Rev. Joseph Strickland, S.J., Rome. London: G. Philip & Son, 1896. Size $12\frac{1}{2} \times 8\frac{1}{2}$, pp. xxxvi. and 76. Price 10s. 6d. *Presented by the Publishers.*

This interesting work includes four chapters, entitled respectively, "The meaning of Guayana and Essequibo," "The extent of Spanish colonization in Guayana," "The extent of Dutch colonization in Guayana," "The case between Venezuela and England." Then follow a series of valuable Spanish documents, relating to the Jesuit missionaries in Guiana, and the reproductions of five manuscript maps.

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An official epitome of up-to-date information regarding Jamaica.

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Australian Museum, Sydney. Memoir. III. The Atoll of Funafuti, Ellice Group: its Zoology, Botany, Ethnology, and General Structure based on collections made by Mr. Charles Hedley, of the Australian Museum, Sydney, N.S.W. Part I. Published December 21, 1896. Sydney, 1896. Size $10 \times 6\frac{1}{2}$, pp. 86. *Illustrations.*

Hawaii.*American J. Science* (4) 2 (1896): 421-429.**Lyons.**

Chemical Composition of Hawaiian Soils, and of the Rocks from which they have been derived. By A. B. Lyons.

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Resultate der meteorologischen Beobachtungen in Jaluit im Jahre 1895.

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Pioneer Work in the Alps of New Zealand. A Record of the First Exploration of the chief Glaciers and Ranges of the Southern Alps. By Arthur P. Harper, M.A. London: T. Fisher Unwin, 1896. Size 9×6 , pp. xvi. and 336. *Map and Illustrations.* Price 21s. *Presented by the Publisher.*

This book is noticed in the *Monthly Record*.

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Statistics of the Colony of New Zealand for the year 1895. Wellington, 1896. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. xii. and 451.

The complete statistical report for 1895 is preceded by a summary of the statistics since the beginning of the colony.

- Samoa.** *Ann. Hydrographie* 24 (1896): 482-483. **Winkler.**
 Zur Hydrographie der Samoa-Inseln. Aus dem Reisebericht S.M.S. *Rusard*,
 Kommandant Korv.-Kapt. Winkler. *With Chart.*
 Contains a chart of the anchorage at Aleipata.
- South Australia and Tasmania.** **Tate and Dennant.**
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 Correlation of the Marine Terrestrial of Australia. Part III, South Australia and
 Tasmania. With General Remarks and Appendices. By Professor Ralph Tate
 and J. Dennant. *With Plate.*
- Tasmania—Glaciation.** *P.R.S. Tasmania*, 1894-95 (1896): 56-65. **Moore.**
 Further Discoveries of Glaciation in Tasmania. By T. B. Moore.
- Tasman's Voyage.** *P.R.S. Tasmania*, 1894-95 (1896): 27-33. **Mauk.**
 Note on a Manuscript Chart in the British Museum, showing 'Tasman's Tracks'
 in the Voyage of 1642-4. By A. Mauk. *With Chart.*

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- Arctic.** **Nansen.**
 Fridtjof Nansen's 'Farthest North,' being the Record of a Voyage of Exploration
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 Nansen and Lieut. Johansen, with an Appendix by Otto Sverdrup, Captain of
 the *Fram*, about One Hundred and Twenty full-page and numerous text illus-
 trations, sixteen Coloured Plates in facsimile from Dr. Nansen's own sketches,
 etched Portraits, Photogravures, and Maps. 2 vols. London: A. Constable & Co.,
 1897. Size 10 x 7, pp. (vol. I.) xvi. and 510; (vol. II.) xiv. and 670. Price 42s.
Presented by the Publishers.
 This will be specially noticed.
- Arctic.** *Rev. Scientifique* (3) 7 (1897): 65-72. **Rabot.**
 Les explorations arctiques en 1896. Par M. Ch. Rabot.
- Franz Josef Land.** **Brice.**
 The Jackson-Harmsworth Polar Expedition. By Arthur Montefiore Brice. From
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 Refers to the work of Payer and of Jackson.

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 Ein Beitrag zur physikalischen Geographie. Erläuterung zur "Kartographischen
 Darstellung der täglichen Bewegung der Erde." Von J. v. Hegner-Ratzfeld.
With Plate.
- Nautical Almanac.**
 The Nautical Almanac and Astronomical Ephemeris for the year 1900, for the
 Meridian of the Royal Observatory at Greenwich. Published by order of the
 Lords Commissioners of the Admiralty. Also Part I. (containing such portions
 as are essential for navigation). London: Eyre & Spottiswoode. Size 9 x 6,
 pp. xiv, 638, 18, and 8; (Part I.) xiv. and 314. Price 2s. 6d. Part I. 1s.
Presented by the Admiralty.
- Positions at Sea.** *Nautical Mag.* 65 (1896): 1117-1127. **Goodwin.**
 Ex-Meridians—Ancient and Modern. By H. B. Goodwin.
 On ex-meridian altitudes for the determination of positions.
- Position Determinations.** *Petermanns M.* 42 (1896): 252-258, 275-280. **Harzer.**
 Ueber geographische Ortsbestimmungen ohne astronomische Instrumente. Von
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 Graphische Darstellung der Fehlergleichungen für Längen- und Breitenbestim-
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 A method for showing the effect of a given error in observation on the position of a
 ship by constructing diagrams.

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Lunar and Terrestrial Mountains.

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Annuaire Club Alpin Français 22, 1895 (1896): 363-403.

Les montagnes de la Lune. Par M. Pierre Pulzeux.

M. Pulzeux describes the characteristic forms of lunar mountains with reference to the probable mode of origin, and compares them with terrestrial features.

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Gleichen 70 (1896): 325-329.

Schott.

Die Hydrographie der skandinavischen Gewässer in ihrer Bedeutung für die Fischerel. Von Dr. Gerhard Schott, Hamburg. With Illustrations.

A report of the work accomplished by Prof. Pettersson, with international co-operation, in the seas surrounding Southern Scandinavia.

Oceanography and Climate.

Hautreux.

Les Glaces de Terre-Neuve et notre climat. Les Trajets des tempêtes dans l'hémisphère Nord. Par M. Hautreux.—Congrès National des Sociétés Françaises de Géographie. 16^e Session, Bordeaux, Août 1895. Compte Rendu. Bordeaux, 1896. Size 10 x 6½, pp. 81-89.

Oceanography—Fisheries.

Layec.

La situation de la pêche côtière en France et la vulgarisation des notions d'océanographie. Par M. Layec.—Congrès National des Sociétés Françaises de Géographie. 16^e Session. Bordeaux, Août, 1895. Compte Rendu. Bordeaux, 1895. Size 10 x 6½, pp. 136-153.

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Berichte der Commission für Erforschung des östlichen Mittelmeeres. Fünfte Reihe. (Aus den Denkschriften der Kais. Akademie der Wissenschaften in Wien. Bd. lxxiii.) [Not dated.] Size 12 x 9½, pp. 118. Plates.

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Contemporary Rev. 70 (1896): 761-783.

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The Progress of Mankind. By Elisée Reclus.

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Harrisee.

La cartographie verrazanienne. Par H. Harriese.

Historical—Ophir.

Osterr. Monats. Orient 23 (1896): 76-89, 111-126.

Feigl.

Das Goldland Ophir. Von Hermann Feigl. With Map.

The author brings forward evidence for regarding Sofala as Ophir, and for believing that the ships of Hiram were in the habit of sailing from Kalongcher, on the Red Sea, round the south of Africa to Tartessus.

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B.S. d'Études colon. 3 (1896): 100-136.Relations des Blancs avec les Indigènes. (Extrait du *Manuel du Voyageur et du Résident au Congo*.)

Naval History.

Mahan.

Nav. Maritime et Colon. 121 (1894): 339, 497; 122 (1894): 5, 344, 552; 123 (1894): 128; 126 (1895): 205; 127 (1895): 323; 128 (1896): 95, 211, 470; 129 (1896): 65, 463; 130 (1896): 82, 250.

Influence de la puissance maritime sur l'histoire [1600-1783]. Par M. A.-T. Mahan; traduit de l'anglais. Par M. Bolas.

This is a translation of Captain Mahan's great work, 'The Influence of Sea-power upon History.'

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Stated.

The True Life of Capt Sir Richard F. Burton, K.C.M.G., F.R.G.S., &c. Written by his niece, Georgiana M. Stated. London: H. S. Nichols, 1896. Size 7½ x 5½, pp. xvi. and 420. Portrait. Price 3s. Presented by the Author.

Miss Stated gives a thoroughly readable account of the life of Sir Richard Burton, and expresses the views of his relatives on certain passages in the biography written by the late Lady Burton.

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La vie et les travaux géographiques de Cassini de Thury, auteur de la première carte topographique de France. Par L. Drapeyron.

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 Edmond Cottreau. *With Portrait.*
- Denhardt.** *Deutsche Rundschau* G. 19 (1896): 152-154. —
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- Egil.** *G.Z.* 2 (1896): 601-605. **Oppermann.**
 Prof. Dr. J. J. Egil. Von Edmund Oppermann.
- Gama.** *Deutsche Rundschau* G. 19 (1897): 183-185. —
 Vasco da Gama. *With Portrait.*

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- Almanac.**
 Annuaire pour l'An 1897, publié par le Bureau des Longitudes. Avec des Notices scientifiques. Paris: Gauthier-Villars et Fils. Size 8 x 4, pp. vi, 738, 82, 20, 14, 30, 12, 3, 4, 18, and 40.
 This is the 191st annual issue of this important almanac.
- Almanac.** **Olsen.**
 1897. The Fisherman's Nautical Almanack and Tide Tables. A Directory of British and Foreign Fishing Vessels, Steamers, etc. By O. T. Olsen. London: J. D. Potter. Size 7½ x 5, pp. 420. *Plan. Price 1s. Presented by the Compiler.*
- Anthropology.** **Steinen.**
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 A Sketch of Lake-dwelling Research. By Robert Munro.
- Ballooning.** *J. and P.R.S. New South Wales* 29 (1895): 40-47. **Hargrave.**
 Paper on Aeronautical Work. By Lawrence Hargrave. *With Plates.*
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 Faktiskaelser under en ballongfärd den 4 Augusti, 1894, 29 November 1894, 17 Mars 1895. Af S. A. Andrés. *With Plates.*
- Ballooning.** **Schnecko.**
 Ueber die Bedeutung wissenschaftlicher Ballonfahrten. Festrede gehalten in der öffentlichen Sitzung der K. b. Akademie der Wissenschaften zu München am 15 November 1894. Von L. Schnecko. München: 1894. Size 11½ x 9, pp. 24. *Presented by the Author.*
- Bibliography.**
 Summary of the Original Articles which have appeared in the *Canadian Naturalist*. Size 2 x 6, pp. [28].
 This is not a summary in the sense usually given to the word, but a table of contents of each of the eight volumes of the first series and the ten volumes of the second series. No dates are given.
- Bibliography.** **Rausch.**
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 Katalog der Bibliothek der Geographischen Gesellschaft in München. München, 1896. Size 8½ x 6, pp. viii and 102.
- Bibliography.**
 General Index to the Fourteen Volumes of the Proceedings of the Royal Geographical Society, New Series, 1879-1892. London: Royal Geographical Society, E. Stanford, 1896. Size 10 x 6½, pp. xx and 250. *Price to Fellows, 2s.; to Non-Fellows, 5s.*
 A note on this index appears in the *Journal* for February, p. 218.

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Catalogue Général de la Librairie Française, continuation de l'ouvrage d'Otto Loreux (Période de 1840 à 1885, 11 volumes) Tome Treizième (Table des Matières du Tome xii, 1886-1890). Rédigé par D. Jordell. Deuxième Fascicule, L—Z. Paris: Librairie Nissson, 1896. Size 10 x 6½, pp. [236].

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The Canadian Dominion and proposed Australian Commonwealth: a Study in Comparative Politics. By J. G. Bourinot.

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Quarterly J. Geol. S. 52 (1896): 651-658. Montesous de Ballere.

Seismic Phenomena in the British Empire. By M. P. de Montesous de Ballere. (Translated by L. L. Belinfante.) With Maps.

Contains statistics of Earthquakes and seismic maps of the British Isles, India, Australia, Africa, Canada, the West Indies, and appeals for a more systematic study of earthquake phenomena.

British Empire.

Statistical Abstract for the several Colonial and other Possessions of the United Kingdom in each year from 1881 to 1895. London: Eyre & Spottiswoode, 1896. Size 10 x 6½, pp. 272.

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Barbier.

Rapport sur la question des renseignements coloniaux. Par M. J.-V. Barbier.—Congrès National des Sociétés Françaises de Géographie, 16^e Session. Bordeaux, Août 1895. Comptes Rendus. Bordeaux, 1896. Size 10 x 6½, pp. 108-136.

Colonization.

Dodd.

Essays on Colonizing and Changes in the Past, Present, and Future of the World. Compiled by Robert Dodd. Carlisle: Muir & Co.; London: Printed by W. Reeves, 1896. Size 7½ x 5, pp. xvi, and 102. Price 1s.

A compilation suggestive of the essays of an intelligent schoolboy.

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Dabney.

U.S. Department of Agriculture. Bulletin No. 23. The Cotton Plant: its history, botany, chemistry, culture, economics, and uses. Prepared . . . with an Introduction by Charles W. Dabney, junr., M.D. Washington, 1896. Size 9½ x 6, pp. 434. Illustrations. Presented by the U.S. Department of Agriculture.

A monograph of the economies of raw cotton, with special regard to the United States, but referring also to the conditions in other producing countries. A coloured map of the typical soil areas of the cotton belt in the southern states is given.

East India Company.

Letters received by the East India Company from its servants in the East. Transcribed from the "Original Correspondence" Series of the India Office Records. Vol. I, 1602-1613. With an Introduction by Frederick Charles Danvers. London: Low & Co., 1896. Size 3½ x 6½, pp. xlii, and 364. Presented by the Secretary of State for India.

This is in a sense a continuation of the 'First Letter-book of the East India Company,' but the spelling of the original is modernized, except in the case of place-names, the modern spelling of which is given in brackets, and instead of notes on the text, a general introduction and glossary have been supplied. The letters are very interesting, full of adventures of the sea and of trade amongst the peoples of India and of the Malay Archipelago.

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Geographical Education. By Andrew J. Herbertson. Also separate Report. Presented by the Author.

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The Position of Geography as a School Subject. By Mr. E. G. Hewlett.

Educational—Methods.

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Klafe.

Die geographischen Lehraufgaben der beiden Tertiären. Von Dr. H. Klafe.

Criticisms on the official syllabus for geographical teaching in German schools.

Educational—Text-books.

Longmans' Geographical Series. Book II. The World for Junior Students (pp. viii and 496); Book III. The World for Senior Students (pp. viii and 528); Book IV. The British Empire (pp. xii and 284); Book V. A Primary Physical Geography. By John Thornton, &c. (pp. viii and 144). London: Longmans & Co.

Size $7\frac{1}{2} \times 5\frac{1}{2}$. *Maps and Illustrations.* Prices: No. 2, 3s.; No. 3, 4s. 6d.; No. 4, 5s. 6d.; No. 5, 2s. *Presented by the Publishers.*

The general geographies, which are anonymous, are good examples of their kind, and are distinguished from most other English schoolbooks by the introduction of clear coloured maps printed with the text. An original feature in the little physical geography is an illustrated glossary.

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L'immigration asiatique dans nos colonies. Par M. Castonnet des Fossas.—Congrès National des Sociétés Françaises de Géographie. 16^e Session. Bordeaux, Août 1895. Compte Rendu. Bordeaux, 1896. Size $10 \times 6\frac{1}{2}$, pp. 236-247.

Gazetteer.

Penzler.

Wörter geographisch-statistisches Lexikon . . . Achte . . . Auflage. Unter der Redaktion von Joh. Penzler. Zweiter Band, L—Z. Leipzig: Otto Wiegand, 1895. Size $11 \times 7\frac{1}{2}$, pp. 1202.

Ice.

Bihang K. Soensk. Vetensk.-Ak. Handl. 21 (1895): 1-13. **Hamburg.**

Studien über Meereis und Gletscheris. Von Axel Hamburg. *With Plates.*

Studies on the formation and peculiarities of sea-water ice and glacier ice.

Lothaire Case.

Le Procès Lothaire à Bruxelles. Publié par la Société Antiesclavagiste de Belgique, 1896. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 72.

The documents and speeches in the Lothaire appeal, heard at Brussels, against the decision of the Courts of the Congo Free State.

Mountaineering. *Annuaire Club Alpin Français* 22, 1895 (1896): 352-556. **Marsy.**

Une ascension à Roche-Mulot en 1688, d'après une relation du voyage du seigneur de Villamout. Par M. le comte de Marsy.

Wilson-Barker and Allingham.

Navigation.

Navigation: Practical and Theoretical. By David Wilson-Barker and William Allingham. With numerous Illustrations and Examination Questions. London: Charles Griffin & Co., 1896. Size $7\frac{1}{2} \times 5$, pp. xli and 154. Price 3s. 6d. *Presented by the Publishers.*

Both the theory and practice of navigation are dealt with in a very thorough manner by the authors in this little book. It is a distinct improvement on works of the same class, published for the use of seamen, and will be of great service to persons who desire to make themselves thoroughly acquainted with the principles of navigation.

Ordnance Survey Maps. *J. Manchester G.S.* 11, 1895 (1896): 217-231. **Crook.**

Report to the Manchester Geographical Society on the Sale and Distribution of Ordnance Survey Maps. By Mr. Henry T. Crook.

Petroleum—Distribution.

Mengeot.

Du pétrole et de sa distribution géographique dans le monde. Par M. Albert Mengeot.—Congrès National des Sociétés Françaises de Géographie. 16^e Session. Bordeaux, Août 1895. Compte Rendu. Bordeaux, 1896. Size $10 \times 6\frac{1}{2}$, pp. 334-353.

Seamanship.

Wilson-Barker.

A Manual of Elementary Seamanship. By D. Wilson-Barker. London: C. Griffin & Co., 1896. Size $7\frac{1}{2} \times 5$, pp. xli and 120. *Illustrations.* Price 5s. *Presented by the Publishers.*

This is a thoroughly practical little book, designed as an introduction to the art for young officers in the merchant service, but likely also to be very useful to yachtmen.

The Wheel in Folklore.

Simpson.

The Buddhist Praying-Wheel, a Collection of Material bearing upon the Symbolism of the Wheel and circular movements in Custom and Religious Ritual. By William Simpson. London: Macmillan & Co., 1896. Size $9\frac{1}{2} \times 6$, pp. viii and 304. *Illustrations.* Price 10s. *Presented by the Publishers.*

This is a book of great interest. The Buddhist praying-wheel is usually looked on as peculiar to Tibet, and its use almost always explained as a labour-saving contrivance. Mr. Simpson, starting from the Buddhist machines, traces the symbolism of the wheel through all countries, races, and religions, and shows that the Tibetan form of worship is only one form of expression of an almost universal symbolism, founded on the daily path of the sun. The references to points in religious ritual and folk-lore are of the most unexpected and even startling character.

Tree-myths.**Philpot.**

The Sacred Tree; or, the Tree in Religion and Myth. By Mrs. J. H. Philpot. London: Martinell & Co., 1897. Size $9\frac{1}{2} \times 6$, pp. xvi. and 180. *Illustration. Price 8s. 6d. Presented by the Publishers.*

The folk-lore of trees is collected in this little volume from the people of all lands and all times. The wideness of the distribution in time and space of some of the tree-myths cited is very remarkable, and the treatise is illustrated by numerous drawings of symbolic trees.

Tropical Diseases.

G.Z. 2 (1896): 617-625.

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Die Tropenpathologie. Von Dr. Karl Däubler.

Submarine Navigations.

C. Rd. 123 (1899): 860-863.

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Étude théorique sur la plongée des sous marins. Mémoire de M. Leflaive.

A mathematical study of the movements of a submarine boat steered by several rudders in horizontal and vertical planes.

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List of the Vertebrated Animals now or lately living in the Gardens of the Zoological Society of London. Ninth edition, 1896. London: Longmans & Co. Size 9×6 , pp. xvi. and 724. *Illustrations. Presented by the Zoological Society.*

NEW MAPS.

By J. Coles, Map Curator, R.G.S.

ARCTIC REGIONS.**North Pole.****Supan**

Die Grenzen der unbekannten Polargebiete. Von A. Supan. Scale 1: 20,000,000 or 316 stat. miles to an inch. Petermann's 'Geogr. Mittheilungen,' Jahrgang 1897, Tafel 3. Justus Perthes, Göttingen. *Presented by the Publisher.*

EUROPE.**England and Wales.****Ordnance Survey.**

Publications issued since January 8, 1897.

1-inch—General Maps:—

ENGLAND AND WALES:—26S revised, engraved in outline, 1s.

6-inch—County Maps:—

ENGLAND AND WALES:—Lancashire, 116 s.w., 114 s.e., 115 n.e. s.w., 117 n.e., 118 n.w. s.w., showing Manchester Ship Canal, revised, 1s. each.

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Europe.

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Carte géologique internationale de l'Europe. 49 feuilles à l'échelle de 1 : 1,300,000 or 236 stat. miles to an inch. *Livraison II*, contenant les feuilles A. v., A. vi., B. v., B. vi., C. vi. La Carte, votée au Congrès géologique international de Bologne en 1881, est exécutée conformément aux décisions d'une Commission internationale avec le concours des Gouvernements, sous la direction de MM. Beyrich et Hauchecorne. Berlin: Dietrich Reimer, 1896. *Presented through the Royal Society.*

This is *Livraison II* of the geological map of Europe which is in course of preparation in conformity with a resolution passed by the International Geological Congress of 1881. The maps in the present issue contain South-Western France, Spain, Portugal, part of the African shores of the Mediterranean, part of Italy, and the Balearic islands, Corsica, Sardinia, and Sicily. This important map will be completed in 10 sheets, 11 of which are now published.

Poole.

Europe.

Historical Atlas of Modern Europe from the Decline of the Roman Empire; comprising also maps of parts of Asia and of the New World connected with European History. Edited by Reginald Lamb Poole, M.A., F.R.S., Lecturer in Diplomatic in the University of Oxford. Part IV. Oxford: at the Clarendon Press; London, Edinburgh, and Glasgow: Henry Frowde; Edinburgh: W. & A. K. Johnston, 1897. Price 3s. 6d. *Presented by the Clarendon Press.*

This part contains: Map 1, The Roman Empire, circ. 350, by Professor Buty, Litt.D.; Map 20, England and Wales under the House of Lancaster, by James Tait, M.A.; Map 30, Ireland under the Early Tudors, by Robert Dunlop, M.A. Each map is accompanied by explanatory letterpress, and they are all very clearly drawn.

Germany.

Lepsius.

Geologische Karte des Deutschen Reichs auf grund der unter Dr. C. Vogels Redaction in Justus Perthes' Geograph. Anstalt ausgeführten Karte in 27 Blättern in 1 : 300,000 or 7.8 stat. miles to an inch. Bearbeitet von Dr. Richard Lepsius. Lieferung IX. Blatt 1 u. 2 Justus Perthes, Gotha. Price 3 marks.

Hull.

Bartholomew.

New Plan of Hull from the Ordnance Survey. By John Bartholomew, F.R.S.E. Revised to date by Local Authorities. Scale 5.8 inches to a mile. London: W. H. Smith & Son. Price 1s. *Presented by Messrs. J. Bartholomew and Co.*

Spain.

Dirección general del Instituto Geográfico y Estadístico.

Mapas Topográficos de España. Scale 1 : 50,000 or 0.78 stat. mile to an inch. Sheet No. 791, Chinchilla de Monte-Aragón; 792, Alporc; 817, Provincia de Albacete, Pétrola; 840, Buenserrida; 842, Provincia de Albacete, Lister; 843, Provincia de Albacete Hellín; 838, Provincia de Córdoba El Viso; 860, Fuencaliente; 851, Solana del Pino; 862, Santa Elena; 863, Aldeanueva; 867, Provincia de Albacete Elche de la Sierra; 873, Provincia de Córdoba Fuenteovejuna; 880, Provincia de Córdoba Espiel; 881, Provincia de Córdoba, Villanueva de Córdoba; 882, Venta de Cardena; 883, Virgen de la Cabeza; 884, Provincia de Jaén La Carlina. Dirección General del Instituto Geográfico y Estadístico, Madrid.

AFRICA.

Africa.

Service Géographique de l'Armée.

Carte de l'Algérie. Scale 1 : 50,000 or 0.78 stat. mile to an inch. F^o No. 61, Marceau; 271, Lamoricière. Dressé, gravé et publié par le Service géographique de l'Armée, Paris. Price 1 fr. 50 c. each sheet.

Africa.

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Africa.

Hassenstein.

Das äthiopische Schoa und die nördlichen Gebiete der Galla und Samal. Nach den neuesten Forschungen entworfen und gezeichnet von Dr. B. Hassenstein. Scale 1 : 2,000,000 or 31.4 stat. miles to an inch. Petermann's 'Geogr. Mittheilungen,' Jahrgang 1897, Tafel 2. Justus Perthes, Gotha. *Presented by the Publisher.*

AMERICA.

America, Central.

Sapper.

Vulkane in San Salvador und Südost-Guatemala. Nach eigenen Aufnahmen im Jahre 1895 gezeichnet von Dr. Carl Sapper. Scale 1: 10,000 or 6·8 inches to a stat. mile. Petermann's 'Geogr. Mittheilungen,' Jahrgang 1897, Tafel 1. Justus Perthes, Gotha. Presented by the Publisher.

GENERAL.

The World.

Johnston.

The Victoria Regina Atlas. Political, physical, and astronomical. Containing two hundred plates and complete Index. W. & A. K. Johnston: Edinburgh & London, 1897.

This atlas contains 200 sheets of maps, on which many plans of cities and ports are given on an enlarged scale. Its principal feature is the space which is devoted to the maps of the British Empire.

CHARTS.

Admiralty Charts.

Hydrographic Department, Admiralty.

Charts and Plans published at the Hydrographic Department, Admiralty, during November and December, 1896.

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2011 Holyhead harbour.	New Chart.	
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	New Chart.	
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219 Plan of Saban bay on this sheet.	New Chart.	
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2421 Plan of Lifuka anchorage on this sheet.	New Chart.	
	Lifuka island, anchorage and approaches	473
1939 Plan of channel north from Magdalena bay on this sheet.		

Charts that have received Important Corrections.

No. 171, Index chart of Admiralty sailing directions. 1491, England, east coast:—Harwich harbour. 1237, Ireland, north coast:—Lough Larne with Larne harbour. 2300, Norway:—Svender to Koster islands. 2203, White sea:—Sheet 1: Cape Cherni to Sozonera mount. 2751, Spitzbergen. 2302, Gulf of Rahnna:—Sheet 7:—Tons point round the head of the gulf to Taurö. 2070, Turkey:—Saloniki bay. 2754, North America, east coast:—Long island sound, Sheet 1. 763, West India islands and Caribbean sea, Sheet 3. 1278, Chile:—Cape Paquien to Cape Lobos. 2324, North America, west coast:—Cape San Lucas to San Diego bay. 1922, British Columbia:—Fraser river and Burrard inlet. 2659, Vancouver island:—Haro and Rosario straits. 579, Vancouver island:—Strait of Georgia, Sheet 1. 582, Vancouver island:—Goletas channel to Quatscho sound. 646, Africa, east coast:—English river, bar, and harbour. 813, Ceylon, south coast:—Negombo on the west to Caratteros on the east. 914, Ceylon:—Colombo harbour. 2760, Sumatra, west coast:—Acheh head to Tyngkok bay. 911, Anchorages between Borneo and New Guinea. 1271, Korea:—Fonlina point to Linden point, etc. 1090, Australia, east coast:—Port Jackson. 1890, Australia, east coast:—Woolongooloo and Farm Cove anchorages. 1670a, Australia, east coast:—Moreton bay. 147, Western approaches to Torres strait. 2421, Tonga or Friendly islands. (*J. D. Potter, agent.*)

United States Charts.

U.S. Hydrographic Office.

No. 1574, Port Livingston and approaches to Dulce rivers. From a survey in 1896 by the officers of the U.S.S. *Dolphin*, Commander W. T. Burwell, U.S.N., commanding. Price 75 cents.—No. 1573, Hospital blight, Humdura bay (Amatique gulf), Guatemala. From a survey in 1896 by the officers of the U.S.S. *Dolphin*, Commander W. T. Burwell, U.S.N., commanding. Price 50 cents.—Pilot charts of the North Atlantic and North Pacific oceans for December, 1896, and January, 1897. U.S. Department of the Navy, Bureau of Navigation. Published at Washington, D.C., December, 1896, at the Hydrographic Office, Charles D. Sigbee, commander U.S.N., Hydrographer. Presented by the U.S. Hydrographic Office.

PHOTOGRAPHS.

Lapland, Novaya Zemlya, etc.

Pearson.

Album containing 115 photographs taken during the voyage of the S.Y. *Saxon* to Russian Lapland, Kolguev, and Novaya Zemlya, May 24 to August 12, 1895. Presented by Henry J. Pearson, Esq.

This series of photographs contains views taken on the coasts of Norway, Russian Lapland, Kolguev island, and Novaya Zemlya. Many of these are of special interest as illustrating the scenery, and the dwellings of the Samoyeds. The value of these photographs has been added to by the careful manner in which Mr. Pearson has arranged and described them in the album.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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VOL. IX.

THE FIRST CROSSING OF SPITSBERGEN.*

By Sir W. MARTIN CONWAY.

ON June 17, 1596, Spitsbergen was discovered by the Dutch navigator, William Barents. On the 300th anniversary of that day, by a strange chance—for it was nothing but a chance—the party of which I had the honour to be leader came in sight of the island. During those three centuries its coasts and waters have been more frequently and better studied than any other portion of the Arctic regions; but the interior remained practically unknown, and had only been penetrated by explorers on three occasions. In 1892, Herr Gustav Nordenskjöld crossed the inland ice in three days from Horn sound to Schoonhoven (Recherche bay); in July of the same year he spent four days in the hill country between Advent and Coles bays; lastly, in 1892, Mons. Charles Rabot, with some men from the French man-of-war *La Manche*, landed at Sassen bay, and spent three days marching up the Sassendal, ascending Peak Milne-Edwards, and returning to Sassen bay by the same route.

Our party consisted of Dr. J. W. Gregory, whose book on the 'Great Rift Valley of East Africa' is well known; Mr. A. Trevor-Battye, author of 'Ice-bound on Kolguef'; Mr. E. J. Garwood, an expert mountaineer, geologist, and photographer; and my cousin, Mr. H. E. Conway, artist. We took with us two Norwegian sailors, two Tromsø ponies to draw our sledges, and one whale-boat. After some trouble with the ice that infested the seas to the south and west of Spitsbergen and delayed our entry into Ice fjord, we made a successful landing on Advent point, the spit which protects the mouth of Advent bay. Our steamer was shared with the

* Paper read at the Royal Geographical Society, January 23, 1897. The common spelling of the name Spitzbergen is wrong. The name is Dutch, and should be spelt Spitsbergen (from *spits*, "a point"). Map, p. 472.

proprietors of a wooden inn which was to be erected, and since has been erected, on Advent point. The inn, however, was of no use to us, for it did not come into existence till some weeks after any work we had to do in its neighbourhood had long been finished. The weekly boat, however, that came to bring up tourists was a convenience, for it enabled us to keep in touch with the outer world.

Before sailing from home I read, I believe, everything published about Spitsbergen in the chief European languages and Dutch. The Scandinavian tongues are unknown to me. I also conversed with many persons who had been in Spitsbergen. The result was that I had, as usual, received an entirely false impression of what the interior would be like. We expected to find a series of boggy coast valleys, and a snowy or icy interior. Acting on the best advice we could get, we equipped ourselves with Nansen sledges, and with ponies to draw them. The sledges were utterly unsuited to the work they had to do, and involved us in infinite troubles. The last thing we expected to find was an intricate mountain country, a tangle of ridges and valleys. A German traveller, who in 1891 climbed Mount Lindström, and, for a wonder, looked into the interior, described it as an "*unabsehbare weisse Fläche*." It is, however, nothing of the sort. We expected to be able to gain a good general idea of the country by taking two or three lines across it. The moment we actually saw the nature of the ground, it became evident that nothing worth doing could be accomplished in that fashion.

A glance at the map we made will show the kind of country we had to explore, and the nature of the information with regard to its topography that was worth obtaining. The northern and southern parts of Spitsbergen are, in the main, covered with great accumulations of ice, except along the west shore of Wijde bay, where is a relatively fertile area. The middle of the island, west of the main watershed, is a region of boggy valleys, fertile slopes, and mountain ridges, or the remains of a high plateau. The nature and interest of this country can be shown by a few specimen areas. The east shore of Wijde bay is formed by a long and very uniform slope, about 1000 feet high. The ice-sheet almost reaches the edge of this slope, except at a few places where the plateau has been broken down into valleys, whereby tongues of ice reach or approach the sea. Here you have an example of a plateau protected from denudation by ice. Along the north-east side of the Sassendal you have a very similar plateau, from which, however, the ice-sheet has been withdrawn in recent times. Denudation has begun, and the plateau is being cut down by narrow and precipitous cañons, from which it derives the name Colorado Berg. These cañons are not being gradually lowered, but they are gradually creeping back. However short, all are practically of the same depth. It is at their heads that they are formed. Each is eating its way back with considerable rapidity. Here you have the first stage in the formation of a mountain group.

Consider now the whole area west of the Sassendal, between it and Advent bay, bounded on the north by Ice fjord, and on the south by Advent vale. It appears that the ice that once covered it was gradually withdrawn, beginning from the west. As you go westward, then, you come to mountains in a more advanced stage of manufacture. The hills that look down upon the Sassendal are the bluff-fronted remains of a plateau, only a little more cut down than the Colorado Berg. Except in two cases, the valleys that penetrate them from the Sassendal are short. Further west come rounded hills, such as Mount Insitania. Beyond De Geer valley are maturer peaks, with clearly defined arêtes and faces such as we are familiar with in the general run of mountain regions.

Where mountains are most developed valleys are oldest. Advent vale may be taken as type of these. As the ice retreated eastwards, Advent vale widened and crept back, receiving the drainage of a constantly developing valley-system, whose eastern watershed ran close behind the Sassendal bluffs. Later on the Sassendal tributaries became more active, and ate their way back, stealing one after another of the headwaters of Advent vale. The Esker valley is a good instance of this. It was formerly drained by Advent vale; now it drains in the opposite direction. Brent pass divides the drainages, but will not long continue so to do, for already a small stream, descending almost on to the pass, is in process of being stolen by the Esker. It now divides its waters upon its fan when in flood, one stream going to Advent vale, the other to the Esker. Fulmar valley, which formerly drained into Agardhs (Foul) bay, has been similarly invaded by the Sassendal, and many more instances might be quoted.

The great interest, therefore, of this peculiar island of temperate climate in the midst of Arctic ice-sheets, lies in the fact that here you have one of the very best examples in the world of the processes of mountain and valley manufacture. It was the perception of this fact that altered our plans, and showed that it was a far more important matter to make a fairly detailed examination of one portion (in itself, however, not inconsiderable) of Spitsbergen, than to scamper hurriedly across two or three separate belts. We did, in fact, cross from sea to sea along three different lines; but, instead of selecting them as far as possible from one another, we so arranged them that each should display the flank of the next. We crossed from Advent bay to Klok (Van Mijeu) bay, from Klok bay to Sassén bay, and from Sassén bay to Agardhs bay and back, finally returning along the shore of Sassén bay to Hyperite Hat, and completing our work by expeditions into the heart of the important mountain region to which I have already referred. Having thus cleared the way by what I fear you may think a dry geographical disquisition, I may be permitted to approach the more generally interesting account of adventures by the way.

First, however, I must premise that this journey into the interior was not the whole of our work. A portion of our party remained for some time at the coast, and worked there. Mr. Trevor-Battye and my cousin made various boat-expeditions from Advent Point, and spent some time in and about the North fjord; and Mr. Trevor-Battye went up Dickson's bay to its head, landed there, and made a long expedition up a glacier previously unexplored. Dickson's bay has been visited seldom—by Lamont in 1871, by Professor Nathorst in 1882, by Lieut. (now Major) Stjernspetz, who surveyed it in 1883, by Nordenskiöld, and doubtless by a few others; there is no published description of it, except a too brief account by Stjernspetz, who landed at its head, and walked up the north glacier to a pass whence Wijde bay was visible.

Garwood, on our first arrival, climbed the peak at Cape Staraschkin, and later on our geologists and artist spent a few days at Green harbour for collecting and sketching purposes. The whole party also made, in the little steamer *Expres* (12 tons net), a voyage of over 1000 miles round the coasts of the island, during which we visited North-East land, the Seven islands, traversed Hinlopen strait twice, closely approached Wiches land, visited Andrée's balloon establishment, and entered every considerable bay in Spitsbergen except Lomme bay, Liefde bay, Cross bay, and Michel Reinier's (Van Koulen's) bay. Finally, whilst I remained at Advent Point to try and obtain a solar observation for the purpose of deducing an important true bearing, Garwood and Trevor-Battye went to Horn sound, and made the first ascent of Mount Hedgehog, or Horn Sands Tind, the highest measured mountain in Spitsbergen.

All having landed at Advent Point on June 20, Garwood and I made a trial trip inland, and on the 23rd definitely started with the two ponies and sledges. A brief experience manifested that the task we had undertaken was not going to be a light one. The west shore of Advent bay is formed by a low cliff with slopes above it. The sledges had to be dragged across these slopes. They are boggy, though nothing like the bogs we afterwards encountered, and they are cut up by gullies, large and small. Down each gully flows a stream, arched over at this time by snow-beds. The snow was rotten, and here the ponies stuck for the first of a countless number of times. Each time they stuck we had to dig or haul them out, and ourselves lug the sledges over—a fatiguing operation. Beyond the cliffs we descended on to the flat, consisting of soft mossy bogs, rotten snow-beds, torrents from 1 to 2 feet deep, and bogs consisting of an unsupporting mixture of stones and mud. None of these things were so bad near Advent bay as we found them further inland. The worst were near Agardhs bay. The snow-beds were so sodden that the foot trod right through them, making a green hole, which was immediately filled with water. The streams were innumerable at this time of energetic thaw. In one mile near the



FIG. I.—STRATIFIED MORaine IN ICE-PLOUGH GLACIER.



FIG. II.—CONTORTED MORaine IN ICE.

head of Advent vale, Gregory counted fifty-two channels which had to be waded, besides a number narrow enough to be jumped. Some streams in the island were 100 yards wide or more. All were rapid; some so deep and swift that they carried us off our legs. Frequently they rolled the sledges over and over, tangling up the traces about the ponies' legs and causing complications. The hogs were just hogs, into which the ponies used to stick fast, so that one had to be used to haul the other out. We were often reduced almost to desperation, but ultimately we always got over, thanks greatly to Garwood's energy and resource. It need scarcely be said that a few miles of this kind of country was a day's march. Our range was limited by the powers of the animals. I may as well state once for all that it generally rained when we were marching.

One of our ponies bolted back to Advent point from our first camp. While he was being fetched, Garwood and I made a double journey onward, and formed a camp at the foot of the range of hills that form the watershed between Advent and Klok bays. We called the place Cairn camp (338 feet), and made it our centre for a few days. Hence one afternoon we climbed by a phenomenally rotten and, in places, very narrow rock ridge to Bunting bluff (2480 feet), where we emerged through the cloud-roof into brilliant sunshine, and found ourselves at the edge of an undulating snowfield. The view was of sparkling brilliancy and indescribable beauty. A two hours' tramp over this snowfield and the ascent of a corniced snow-*arête* beyond took us to the summit of Fox peak (3180 feet), whence we looked abroad over a region of glaciers and multitudinous peaks. A valley stretched away at our feet, leading to a wider valley, which debouched into Klok bay. Unfortunately, valleys and bay were alike buried beneath a pall of cloud, through which ranges of snow-white peaks jutted up, far as the eye could reach.

The result of this climb (leaving geology out of the question, of which it is not my part to speak) was to give us an insight into the general topography of an intricate region, and to manifest that there was no route to Klok bay practicable for ponies, at all events at this time of year. Accordingly, next day Garwood and I loaded ourselves with food, instruments, photographic apparatus, rope, and so forth, and set out for Klok bay. We went up a side valley, on to and up the glacier at its head, and so to a pass (Fox pass, 2550 feet) adjacent to Fox peak. This gave access to Plough glacier, down which we waded rather than walked, for the snow was deep and soft in the extreme. For a time we even advanced on all-fours, such was the toilsomeness of upright progression. A dense fog did not make the surroundings more cheerful. Below the glacier came a stony area; then a region of mixed ice, snow, and water at the foot of another glacier; and then a boggy and utterly desolate valley. At one point I tumbled into a pool of snow-slush, and was soured to the skin. We

plodded down the valley till we were too tired to go another step, and then we lay down in a hollow between two walls of snow, with nothing but one mackintosh cape to cover our legs. That was a dreary resting-time. Ice rains fell on us at intervals. A few hours were enough.

Going forward again, we soon came out into a very big flat valley, the valley of the Shallow (Ondiepe) river, as the Dutch called it in their time. Only a bog-flat here intervened between us and the waters of Klok bay. Across the valley were some fine mountains, pouring out a great glacier on to the flat. Other glaciers were seen emptying into the valley higher up. We returned by the way we had come, to near the foot of Plough glacier; then, taking another head valley, we crossed the range by a lower and better pass (Bolter pass, 1340 feet), descended over a wide snowy area, in which a large lake of snow-slush had to be circumvented, and ultimately came out into Advent vale close to our first camp. The walk from thence to our tent at Cairn camp was almost more than we could manage.

After this Gregory joined us, and we went forward up Advent Vale for two marches, and encamped close to Brent pass (450 feet). A large glacier debouched on the plain opposite camp, descending from a wide and far-reaching snowy basin. The edge of this glacier was broken into seracs all the way round, and these kept constantly falling with a loud booming crash. To this glacier Garwood returned a few weeks later, when he climbed on to it, and ascended one of the peaks that rise from it. One more march carried us over Brent pass and down the Esker valley to Advent vale, just where the Esker river tumbles over in rather a finely set little waterfall. The descent of the Esker valley was very laborious, for everything was in the worst possible condition—snow deep and slushy, gullies many and all cluttered up with rotten snow, river flooded, bogs numerous and soft.

From Waterfall camp Gregory walked down to Sassen bay, expecting to meet our comrades; but the ice, packing into Ice fjord, made the mouth of the Sassendal inaccessible by water. So Gregory returned, and next day walked from Waterfall camp to Advent bay by the way we came—a really colossal undertaking, which he accomplished in twenty-four hours. When the ice broke up, he and Trevor-Battye came round, and walked up the Sassendal to join us. Trevor-Battye returned to the boat after a day's visit, and went off to Dickson's bay; Gregory came on with us to the east coast. Garwood and I spent these days exploring the neighbourhood, climbing peaks, and investigating valleys. The weather was beautifully fine, the sun shining brightly all twenty-four hours round. It was a joy to live.

Starting on again, we went up the Sassendal to a big side valley, and turned up it, hoping to find a way to Foul (Agardhs) bay; but the appearance of things not being propitious, we returned next day to the Sassendal, and went further up it to a much bigger side valley. This



FIG. III.—FORMATION OF CRESCENTIC MORAINES, GRIT HINE.



FIG. IV.—TERMINAL MORAINES, IVORY GLACIER.

seemed obviously the right route to take. An endless procession of fulmar petrels, flying up the Sassendal from Ice fjord, all turned up this valley, evidently on their way to the east coast. We named it Fulmar valley, and determined to follow their lead. Mile after mile we advanced, yet never a pass came in sight, nor any sign of an ice-sheet. We began to think we might reach Foul bay without crossing ice at all. Coming to a place where there were old moraines and a change in the aspect of the valley, we pitched camp.

Next day we entered the moraines a short distance beyond camp. They belonged to a set of side glaciers. They formed a hideous chaos of broken rocks, and heaps of mud piled upon ice. The river flowed in an ice gorge, with ice cliffs on either hand and the sloping moraine and ice chaos above. To drag the sledges over this was a terrible job. Once a sledge and pony began sliding down sideways, and were only just arrested at the edge of the ice-cliff. The torrent had to be crossed, various ascents and descents made. Stones were constantly giving way, ponies sprawling about, and almost every accident happened that one can imagine. Ultimately we emerged into an almost level valley, closed at the far end by a wall of ice, which proved to be the side of a great glacier flowing across the valley. The last reach of Fulmar valley was the worst. It was a bog of incredible nastiness. We tried high up, and we tried low down; it was equally bad everywhere. There was always one pony stuck, and often both. How we got through I don't know. At last we did reach the ice-wall, and camped (370 feet) at the foot of it.

While the others were pitching camp, looking after the ponies, and cooking, I went on and climbed the hill to our left of the glacier. An ascent of only 600 feet placed me on the crest of a ridge, which I presently followed for a mile or two to its highest point. The moment I reached the ridge, the great glacier—Ivory glacier—appeared spread out at my feet, pouring down in a wide stream from the inland ice-sheet, whose wide low domes limited the view upwards. Below, it spread out into a vast oval-domed termination, a portion of whose side was the wall that overhung our camp. The whole of this oval-domed end has come down since the year 1871, when Henglin records the main valley as having been a flat green swamp. In the other direction beyond and above this icy dome I saw Foul bay and Wybe Jans Water, with quantities of ice upon the sea, all glittering in sunshine; and then, on the remote horizon, the snow-decked mountain front of Edges land, supporting a brilliant cushion of white cloud. I yelled the good news to my companions below, and went on up the ridge. A gale of wind blew, making wild music in the crags. On I went, passing shoulder after shoulder, and ever finding another ahead, till the last one came, and I looked abroad over the noble ice-sheet, and beheld it swelling up and up to the hurrying clouds or the blue sky. Sunshine

lay in patches upon the splendid expanse; lakes of sapphire-blue here and there diversified the great glacier's frozen area. It was a gorgeous vista. Unfortunately, I had no camera with me, but only surveying instruments. The cold was intense. I could not remain long on the exposed summit. The descent to camp was a long-drawn-out fight with the opposing gale.

Next day (July 17) Gregory, Garwood, and I returned to my first point of observation and again enjoyed a good view, though not so fine a one as before. We descended on to the glacier, and crossed its wide white foot in about two hours' walking. By a great stroke of luck, we hit off what was perhaps the only point where the ice could be quitted easily on the Foul bay side. For there the glacier ends in an ice-cliff over 100 feet in height, falling to a pile of moraine-hills over 200 feet high. The point where we reached the ice-cliff gave access to a slope down which steps could be cut to a snow-slope not too steep for a glissade. We ran down the moraines, and were at once on the swampy flat that fills the head of Foul (Agardha) bay. A stream was waded, and we walked far out on to the flat to an amorphous region that was half land, half water. Stranded icebergs in the bay looked down upon us over the mud-flat. We had crossed to the east coast for the first time on record. I leave you to imagine our satisfaction.

The night that followed our return to camp was signalized by a hideous gale, in which the ponies suffered severely. A pool of mud surrounded the tents. Rolling up our loads, and the mud with them, we fought the way down the valley, and in two days reached Waterfall camp, where we divided, Garwood returning to Advent bay over Brent pass, Gregory and I descending the Sassendal to Sassen bay, and there turning along the coast. We camped at two different places, and made expeditions inland, climbing Mount Lusitania (3120 feet), whose summit Garwood and I had attempted but failed to reach from the other side. We also explored the large valley that divides in half the mountain region between the Sassendal and Advent bay. We named it Do Geer valley, after the leader of the Swedish expedition, at this time engaged in surveying the coast of Ice fjord. An interesting group of side valleys enter Do Geer valley from the west. They contain many small glaciers, and are surrounded by peaks of individual form. Before we could attempt to explore them vile weather returned, and thenceforward these peaks remained buried in clouds as long as we were in Spitsbergen. This area, and a corresponding valley that debouches on Ice fjord near the mouth of Advent bay, were the only portions of this instructive mountain group that we did not actually penetrate, or at least behold from several points of view. We returned to Advent Point thirty-six days after leaving it, and were startled with the changes made in our absence. The tourist inn was built, and was being painted. Other visitors, besides ourselves and the Swedes, had their camps on the spit. Presently



FIG. V.—IVORY GLACIER, OVERRIDING TERMINAL MORAINÉ.



FIG. VI.—VIEW TO WEST OF FIG. V., SHOWING FURTHER ADVANCE.

a German tourist steamer came in and emptied its passengers upon the shore. We felt that we had returned from the wilderness to a centre of advanced civilization.

Having thus very briefly related how we accomplished the main purpose of our expedition, I shall now still more briefly describe the second part of our journey. Whilst making the needful preliminary inquiries in England, as to what had been done in Spitzbergen, and what still needed to be done, I fell under the fascination of the varied and peculiar literature that concerns itself with these inhospitable shores, till the study of that literature became, for me, an object in itself, and not merely a means to an end. There is much in it that is topographically obscure; much, too, that depends for its interest upon the undescribed setting of scenery in which recorded events took place. Thus the attainment of some general knowledge of the Spitzbergen coasts from personal observation became a matter of importance to me, little though I expected to fall in with so rare a chance of accomplishing that end as the summer of 1896 afforded.

For this year the ice left the Spitzbergen coasts. While we were crossing the island, a tourist steamer advanced without difficulty or danger to $81^{\circ} 32'$ —an amazing record. The sea was open away to the east as far as any vessel explored it. There was no ice in Hinlopen strait or in Wijde bay. When knowledge of these facts came to us, I hastened to hire the little 12-ton steamer *Esprez*, which had been taking tourists up to see Andrée's balloon, and, as soon as we could obtain possession of her, away we sailed.

Quitting Advent point on August 5, we ran to Green harbour, picked up our geologizing companions, who had been working there, and steamed northward in dark and heavy weather. Snow and rain besoms swept across the sea one after another in rapid succession, and all the coast hills were hidden in cloud. The only cabin in our boat was no bigger than a grand piano, so that the five of us, having to cook and live in such close quarters, were not easily fitted together. There was no deck to stand on. Every inch of room was occupied by barrels full of coal. We tumbled in this fashion up Keerwyk (or Foreland sound), across the mouth of King's bay, then up the coast, past seven wide glaciers, called the Seven Icebergs, and through the South gat into Dutch bay, on whose western shore once stood Smeerenburg, the blubber-boiling establishment of the Dutch. Over against it, on Danes island, just where the "cookery of Harlingen" used to stand, we found the balloon, which we visited under Herr Andrée's guidance. His skipper sold us more coal, and away we went in the gloomy weather northward to find the ice.

Alas! the edge of the pack had come down more than a degree during the last fortnight. We found it all too soon in $80^{\circ} 15'$, and turned east by south along it for an hour's steaming, then north-east for four hours. The pack now stretched southward, a great cape of ice,

as it proved, coming down upon Verlegen Hook. We feared that our eastward way was to be thus early closed, and our hopes sank rapidly. Between the point of the ice-cape and Verlegen Hook there was, however, a way by which, with tortuous navigation in and out amongst drift ice, we were enabled to reach open water once more. It stretched away to the northward further than we could see, so we steamed on again north-east by north, hoping to get round to the north of the Seven islands. There was a chance, almost a probability, that the pack which was rapidly coming down would beset Verlegen Hook before our return, but we decided to risk it and push forward.

A westward-bound sloop came in sight. We hailed her, and learnt that she had been hunting to the eastward of Outer Reps island, where a fortnight before all had been open water. The pack driving down had forced her to quit that region. Already, her skipper said, the pack was down on the Seven islands. Six hours' steaming carried us to $80^{\circ} 39'$ (Walden bearing east south-east), where we found the pack again, stretching across to Table island. So we ran for Walden, of whose geological structure nothing had previously been recorded (I believe), and landed on its east side. Our ice-master, Bottolfsen, had served the Wellman expedition in the same capacity. With him we visited the ruins of Wellman's hut. We climbed about the weather-worn rock, and had striking views of the cloud-covered Parry's island and its neighbours, and away to the east as far as Cape Platen. Ice-blink showed all round to the east, and the edge of the pack was visible at no great distance. The sea where Phipps' vessels had so narrow an escape, and where young Nelson encountered the bear, was still quite ice-free. Nothing could exceed the desolation of the view in all directions, but especially to the south, where a heavy pall of cloud lay on the inland ice-sheet of North-East Land.

As it was hopeless, in our little iron boat, to try and push eastward, we ran back to Verlegen Hook, and found that a strong south wind was keeping open water off that important point; so we changed our plans once more, and decided to run down Hinlopen strait and see whether we could circumnavigate the main island. Some writer has told of the fine mountains that border this passage. I wished to see them, and, if possible, to get some record of them. As a matter of fact, they do not exist; there are only wall-faced plateau fronts of rock, in no respect striking till you come close under them, so that the scenery of the strait is tame from end to end, the sides and islands being very low in comparison with the width of the channel.

To us the most interesting object seen was the great glacier front that borders the west side of the strait for over 20 miles from Hecla Hook to Lomme bay. It is the edge of the sheet of ice that covers the New Friesland promontory. A fifteen hours' run, during which we saw hardly any floating ice, except a few pieces fallen from the glaciers,



FIG. VII.—MOST WESTERLY VIEW OF IVORY GLACIER, ICE ADVANCING.



FIG. VIII.—VIEW OF TERMINAL FRONTS OF BOONISH AND BALDHEAD GLACIERS.

brought us off Cape Weyprecht, towards which we steamed in hopes to get into Unicorn bay and through Heley's sound. But it was not to be. The bay was full of ice, and Heley's sound was unapproachable. Returning along the edge of the pack, which stretched far out into Olga sea from Barents and Edges Land, we rounded its north point, and then followed along it to the south-east. An ice-blink rising before us extended ever more to the east as we advanced, and finally filled the whole horizon ahead.

The high land of Wiche's Land rose above the horizon, and became more and more definite as we neared it. The pack stretched across to it, and we were strongly drawn to make the land, which no geologist has ever investigated. But neither was this to be. The ice-master refused to linger in these waters in such a tin kettle of a boat under existing conditions, when the ice-pack was, as we had occasion to observe, coming up from the south and would soon be at Cape Torell, where a walrus aloup that we hailed had found it only three days before. All we could do, therefore, was to stay long enough to sketch the outline of the land, and observe the sheet of hyperite that covers its top, and makes a nodding cap to its bold north cape.

The run back to Verlegen Hook presented no new features, save in fresh combinations of clouds, snow-brooms, and barren hills. We rounded the point through drift-ice, and then turned south to explore Wijde bay, again chiefly for the sake of beholding the mountains said to border it. Here we were not to be disappointed. The scenery of Wijde bay is superb. Its level-topped east side, crowned with the edge of the ice-sheet, is broken at three points, where great glaciers descend to the bay between splendid walls of rock. The west coast is lined by a row of mountains, some of grand form, and all together forming an impressive assemblage. A series of deep valleys cut back between them and lead many miles into the interior. The shores at the north end of the bay were buried under snow, and had an exceedingly desolate and arctic appearance, but a little further in a great change of climate became manifest. The snow-line rose to 1000 feet above sea-level; boggy valleys took the place of snow-flats, and such glaciers as there were all descended from high catchment areas of snow.

Having reached Cape Petermann, we made for the west shore of the west fjord, where I landed my companions, and proceeded on alone to the head of the fjord, to see whether it was worth while to land there and make a dash for Dickson's bay and back. The low clouds, however, would have rendered this a valueless exploit, for surveying would have been impossible; so, after sketching and photographing the mountains, I returned for the others, and we steamed back to the north. So strong a south wind (doubtless local) had been blowing for the last two days wherever we were, that we thought it likely Andrée might decide to

ascend in his balloon. We hurried off, therefore, to Dutch bay again, where all was still. The south wind had not blown at that point till we came in.

After a few hours' pause, and obtaining some more coal, we ran out through Danes gat, and then for Magdalena bay. The sun was shining brightly for the first time in a fortnight, and we had a gay passage for a while; but just as we entered Magdalena bay, the "pearl of arctic scenery," as it has been called, a heavy cloud-bank came sweeping up with a squall from the south, and we were only just in time to see the beautiful peaks and steep glaciers that surround this blue inlet overwhelmed by the hurrying battalions of the sky. An hour or two later we were running down the coast again, bound for King's bay, which we entered to its head, to gain some idea of the way the inland ice lies in that neighbourhood, the trend of the glacier valleys, and the nature of the famous Three Crowns peaks. The clouds lifted a little and showed us these things for a brief interval, and all was hidden once more.

I had still an important observation to make in the branch of Bell sound, which is wrongly called Van Mijens bay. Its old name is Klok bay; Van Mijens is a little harbour outside Axel island, in the north shore of Bell sound. A straight run carried us to Cape Lyell, where Gregory was left to collect fossil plants. Then we crossed Bell sound to the north end of Axel island, and entered Klok bay through the narrow passage, where the tide was rushing in wild haste, so that the otherwise calm waters boiled about us and carried our boat this way and that like a cork. Once within the entry all was still. I landed the remainder of my companions on Axel island, and ran on alone towards the mouth of the valley of the Shallow river, or Dry fjord, which I visited for the purpose of linking up the rough survey Garwood and I made when crossing from Advent vale. This was no sooner accomplished than the engines broke down, and we had to anchor for three hours whilst repairs were done. I then visited the little-known and falsely charted south-east extension of Klok bay. It runs much further east than the chart indicates, and its enclosed inner harbour would be an excellent point of attack for this part of the interior of the island. Only late in the season, however, is it likely to be found ice-free.

When the others had been fetched from their different resorts, it was discussed whether we should run for Horn sound. But the necessity, under which I considered myself placed, to make all possible endeavours to get an observation for true bearing at Advent point, compelled me to return there at once, seeing that the steamer that was to carry us back to Norway was due within two days. My agent's blunder was the cause of this early return. I had ordered him, and he had contracted to arrange for us to be fetched about the middle of September. We accordingly went to Advent bay, where Gregory, H. E. Conway, and I



FIG. IX.—ICE TALUS FORMED FROM ADVANCING UPPER LAYERS, BOONING GLACIER.



FIG. X.—VIEW SHOWING RAISED EDGE OF BOONING GLACIER.

were dropped to pack the baggage and make the required observation, whilst Garwood and Trevor-Battye went down to Horn sound and made the first ascent of Hedgehog mountain (or Horn Sunds Tind), whereof an account has been published in the pages of the *Alpine Journal*.

Before the reading of the paper, the PRESIDENT said: There is no occasion to introduce to you our friend Sir Martin Conway, who is so well known for his excellent work in the Karakoram, and I am quite sure he has done equally good work in Spitsbergen.

After the reading of the paper, the following discussion took place:—

Dr. J. W. GUNNOUR: After the long account Sir Martin Conway has given of the narrative of our expedition, it may be better if I refer for a minute or two to some of the scientific problems we went to study, as these were responsible to a large extent for the fact that we did not cover so much ground as we had hoped when leaving England. We never left the bog-filled valleys for the ice without feeling relief, and we never went from the ice to the valleys without regrets. No doubt it would have been easier and pleasanter to have spent the time scampering over the inland ice rather than working in the valleys and on the margins of the ice-sheet. We soon found that if we wanted to do any serious work we must keep in the valleys and on the margins of the ice-sheet. To take one illustration. In a paper read here two or three years ago, Professor Bonney denied that glaciers can do any important work in the way of erosion. In a paper read shortly afterwards by Admiral Markham, he treated this view as beneath criticism, and suggested it was impossible for any man who has seen the glaciers of Greenland to doubt that they had eroded the valleys in which they lie: accordingly, we wished to settle whether the fjords of Spitsbergen had been formed by glacial erosion or in some other way. In England we thought the most suggestive evidence would be obtained by examination of the watershed at several points at a considerable distance from one another, but we had not arrived a week before we saw we should have to tackle the question in a different way. What was wanted was an accurate map of a belt across the island, and not a sketch-map of the ridges. Sir Martin Conway altered his plans, and has made a map which throws much light on the topography and geography of Spitsbergen, and will serve as a basis for the geological map Mr. Garwood and I hope to work out during the coming summer. We don't bring back, I am afraid, any very startling biological novelties; but this will cause little surprise, as biologists have learned to expect as little from arctic work as the Pharisees expected from Nazareth.

There is little apparent connection between dragging sledges through peat bogs and the ordinary work in a museum; but, as a matter of fact, the knowledge gained and the general idea the journey gave me as to the conditions of life in a high arctic latitude will be of very great help in my daily task of trying to decipher the evidence of fossils as to former geographical changes. We also hoped to get a good deal of information as to the ways of arctic ice, and to detect characters by which to determine whether certain English glacial deposits had been formed by land ice, marine ice, or a central ice-cap. In Spitsbergen we could see these forms working side by side. It gave us information which both Mr. Garwood and I thought threw a flood of light on the ordinary phenomena of English glacial geology.

We often hear very exaggerated stories about the changes of climate that have taken place in the arctic regions. We hear of the shores of the Arctic Ocean having been fringed by coral reefs, while along the shores grew groves of palms; but I am afraid the collections we made do not support these exaggerated and

extreme views; which at one time or another have very considerably influenced geology in England, especially as to changes of climate and their causes. We found the country full of interest and with so many problems to work out that the journey was not wasted. And for this we have to thank Sir Martin Conway for the great amount of trouble he devoted to the equipment and preparations.

THE PRESIDENT: We have seen a number of portraits said to represent Mr. Garwood. I have some suspicion that some of them represent Sir Martin Conway himself. I am sure you will be glad to see and welcome Mr. Garwood here, and hear any remarks which he may have to make on the results of the journey.

MR. GARWOOD: After the very thrilling account Sir Martin Conway has given you of my little adventure, I feel rather an impostor in standing before you to-night, for I ought to be somewhere down that river.

I will not take up your time with any general remarks, but I should like to describe to you, with the help of a few photographs on the screen, some of the most interesting points presented by the glaciers we encountered during our expedition across the island.

But before I do this, I show you a photograph of Sir Martin Conway making a survey at midnight on the top of Fox peak, and I should like to express my intense admiration for the manner in which he executed the map which we hold in our hands to-night. On this particular occasion I shivered for nearly half an hour, while he was absorbed in his work, with the thermometer several degrees below freezing-point, and a cutting wind blowing round us from the inland ice.

Turning to the subject of glaciers, this photograph (Fig. 1.) shows very clearly the stratified condition of the moraine which accumulates under the ice. In England we have the problem of the Glacial Period to work out, and we sometimes encounter boulder clays, which, it is said, must have been formed under the sea, because all stratified beds must be formed under water. I just show you that we have in Spitsbergen moraines, which are stratified, being formed 7 or 8 miles from the coast, underneath land-ice.

The next slide (Fig. II.) shows a very interesting example of the action of some of the glaciers in these high latitudes. We have here a glacier composed of several tributary streams united in one valley; the lower portion of the ice-stream has been forced through a narrow channel, and the ice and moraine at the bottom have been bent over at the edges, so that when the ice melts back we shall have a contorted moraine produced. Thus we have examples of both stratified and contorted drift, and both have been formed under land-ice.

In Greenland we have exactly similar examples. I show you these to-night because it is interesting to note that we have the same phenomena occurring in Spitsbergen.

Then we have another perplexing problem of the Glacial Period in Britain—the formation of crescentic moraines. In Spitsbergen we sometimes find tributary glaciers flowing round the sides of mountains down on to the top of larger ice-streams, and as the ends of these melt, they deposit their terminal moraines on the surface of the main glacier; this latter flows down the valley, carrying the terminal moraine with it, and these are melted out and deposited far from the spot where they were formed (Fig. III.).

We had exactly the same thing taking place in England, notably in the neighbourhood of the Pennine range, when glaciers flowed down to the coast round mountain ranges whose summits stood up above the ice, resembling, probably, the Greenland "Nunatakker" of the present day.

Fig. IV. is a photograph to show you the terminal moraine of the Ivory glacier, consisting of rounded water-worn pebbles—an interesting example of a raised beach

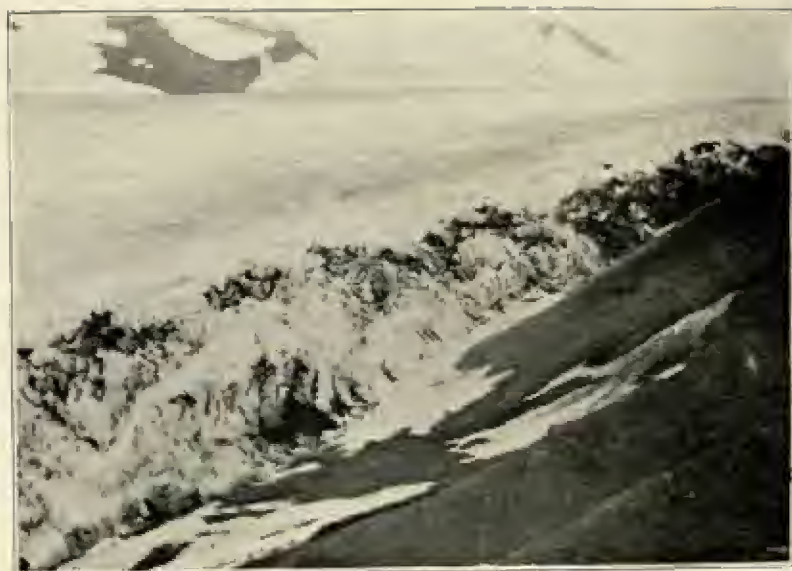


FIG. XI.—DOOMING GLACIER, LOOKING UP.



FIG. XII.—UPPER PORTION OF DOOMING GLACIER, SHOWING CENTER SAGGING AWAY FROM HIDE OF VALLEY.

which has been caught up and deposited greatly above its original level. As far as we can see, the glaciers in Spitzbergen are for the most part advancing.

As we approach its westerly termination, this great glacier is seen over-riding its old terminal moraine (Fig. V.), whilst Fig. VI., taken further to the west, shows a remnant of the terminal moraine with the ice advancing over it.

An interesting point to notice is the mode of advance of these glaciers; the top layers, shearing over the lower ones, advance more rapidly, until they overhang to such an extent that they break off, forming a "talus" of ice below; over this the glacier advances, finally over-riding the moraine completely (Fig. VII.). Glaciers advancing in this manner do not, therefore, push forward loose material lying in their path, but flow over it; the lower layers of ice, embayed behind this obstacle, are, however, dragged over it by the upper advancing layers, and bring up with them fragments of the raised beach frozen into their under surface. Dr. Gregory and myself found no difficulty in collecting fragments of driftwood, shells, and bones of whales, mixed with pebbles, which had been raised several hundred feet above the original level of the beach in this manner. This fact is of great interest.

I went up that peak of which Sir Martin Conway spoke, to study the advance of Booming glacier. From here you can clearly see the character of the advance; the snout and sides of the glacier are over-riding the old terminal and lateral moraines, leaving a depression in the centre. Looking down on it in this way, it bears a striking resemblance to a large dish of trifle, the sides of which are edged with biscuits, represented here by the shattered pinnacles of ice.

It is interesting to compare the terminal face of Booming glacier with that of its shrunken tributary from the Baldhead, now fast receding into its own valley (Fig. VIII.), the latter showing the retreating snout characteristic of an average Swiss glacier, while in the distance can be seen the old lateral moraine.

The next photograph (Fig. IX.) shows a nearer view of the advancing front of Booming glacier, with its characteristic ice "talus." Figs. X. and XI. are two views, one looking down the glacier, and the other looking up; in both of these the raised edge and depressed centre are noticeable. During our first visit, Dr. Gregory and I attempted to cross the glacier. I succeeded in getting up one side, but we doubted if the descent of the other side would prove feasible, and prudently beat a retreat—a precaution which my subsequent observations completely justified (Fig. IX.).

The last view (Fig. XII.) shows the upper part of the glacier, where the centre is shrinking away from the sides. In both this and the neighbouring valley the shrinkage was plainly visible.

An important point to consider is, "Why is this glacier advancing?" It might be said, "Because the climate is getting colder." I am inclined to think that the advance is due, on the contrary, to an amelioration in the climate. The centre has a shrunken appearance in the upper part of the basin; it is, in fact, being drawn away from the sides of the valley. This would not be the case if the advance were due to an increase in the snowfall, and the fact that the Baldhead glacier, before alluded to (Fig. VIII.), is retreating, although occurring in the same snow-basin, also militates against this hypothesis. We know that a rise in temperature decreases the mobility of ice, causing it to move more rapidly, and we must, I think, attribute to this cause the general advance of the Spitzbergen glaciers at the present day, rather than to any refrigeration of the climate.

Sir Martin Conway has told you of the difficulties we had with the sledges drawn by ponies. It has been suggested to me that we did not use the right draught-animal, and, as many of you may wish to go to the district after listening to Sir Martin Conway's very interesting paper to-night, I have brought you an

ideal traveller's equipage. If you harness a polar bear in the shafts, with a reindeer leading, you will, I am convinced, make extremely rapid progress.

THE PRESIDENT: Mr. Trevor-Battye requested that he might be called upon last. I have no doubt he was anxious not to take the wind out of anybody else's sails.

MR. TREVOR-BATTYE: Mr. Trevor-Battye wished to be called upon last in the hope that he might not be called upon at all—a very good reason; and really, after Sir Martin Conway's most charming speech, there is not much for him to say, especially as he is not supported by any views or photographs, although in the next room will be found exhibited his sketches of Dickson's bay, Wijde bay, Hinlopen strait, the Seven Islands, and other places. Frankly, without illustrations it is very hard to be interesting, and therefore, I think, the less I say the better. I will only add to Sir Martin Conway's interesting account, that in Eckman's bay there is a very striking instance of an advancing glacier. This, which I named the "Splendid glacier," is advancing so rapidly that, within the twenty-five years or so that have elapsed since North fjord was surveyed, it has filled up a great part of the head of the fjord, which is put upon the charts as a large branch of the sea, in the middle of which is an island. It has now advanced upon the island, and within a very few years the head of the fjord will be entirely filled up. On the other hand, the most important glacier at the head of Dickson's bay is a retreating glacier, which is dying back very rapidly. It is now so late that I will not ask you to listen to anything more.

THE PRESIDENT: I am sure the meeting will agree with me that we have seldom listened to such an interesting paper, and to such interesting speeches as those that followed it. The description given by Sir Martin Conway of the formation of hills and valleys is particularly interesting and instructive because of its general application. I should have wished to have made various remarks on this subject, only I have a sore throat; but I cannot sit down without referring to the way in which Sir Martin Conway has done his work. You already know, from what you have heard, how able he is as a descriptive geographer, and I wish to bear witness to the trouble he took before starting, and to the trouble he is taking now, to inform himself of the former history of Spitsbergen. I say without any hesitation that Sir Martin Conway has a greater knowledge of the literature of Spitsbergen than any other living man. I am sure you will all wish me to return our very sincere and hearty thanks to him for his most interesting description of Spitsbergen, and for his admirable series of photographs, and you will wish me to thank the members of his staff for the valuable information they have given us.

SIR MARTIN CONWAY'S MAP.—The general outline has been taken from the Admiralty charts, but enlarged, and the interior filled in from a sketch-survey made in June, July, and August, 1895. The southern coast-line of Sassen bay is taken from a map made in 1892 by the officers of the French man-of-war *La Manche* (*Bull. de la Soc. de Géographie*, 1894, p. 56). The coast-line of Temple bay and the northern part of Sassen bay are from Prof. A. G. Nathorst's survey made in 1882 (*Ymer*, 1883, p. 134). The position of peak "Milne-Edwards" was determined by M. Charles Rabot in 1892, on the occasion of the visit of *La Manche*. Details of glaciation of the east coast are taken from Dr. W. Kükenthal's map in *Petermanns Geogr. Mittheilungen*, 1890, Plate 5. Dickson's bay is from the survey made in 1863 by Lieut. Stjernsætz, the neighbourhood of the house at Cape Thordsen is from a survey by the same officer. The coast-line of Klaas Billen bay is from Nathorst and De Geer's survey of 1882. Skana bay is from a survey by the officers of *La Manche* in 1892. The corrections and additions at the head of Dickson's bay are from Mr. Trevor-Battye's observations in 1891.

TWO YEARS' TRAVEL IN UGANDA, UNYORO, AND ON THE UPPER NILE.*

By C. F. S. VANDELEUR, D.S.O., Lieut. Scots Guards.

STARTING from Mombasa on September 7, 1894, with Mr. Jackson and Captain Ashburnham, and a large caravan of about four hundred men, carrying arms and ammunition, we reached Port Alice on Lake Victoria at the end of November, after a most successful march under the leadership of Mr. Jackson, during which only two men died. After a short stay in Uganda, I started with Major Cunningham for Unyoro and the Nile. We followed the road leading by Singo and across the river Kafu at Baranwa, and eventually arrived at the headquarters, Fort Hoima, on January 1, 1895, where Major Cunningham took over the command from Captain Thruston, who was returning home. We were delighted to get our ponies safely across the very bad swamps, and they were the first animals to reach this country from the East Coast. Halting here for five days, we marched to Kibero on the 7th. The country becomes more open on nearing the Albert Nyanza, and rocky in places, until all of a sudden the edge of an enormous escarpment is reached, 1200 feet below which lies the great lake, as a rule covered by a white haze which obscures the horizon and the mountains on the western shore. Our home for the next three weeks was to be a steel boat about 20 feet long, into which we packed ourselves with a crew of sixteen men, consisting of eight Sudanese, most of whom had been on Emin Pasha's old steamers, and eight Zanzibaris, including our own servants. They were certainly the worst rowers I have ever seen. The two races were also always accusing each other of doing no work. Besides them, we had a friendly Wanyoro chief called Keyser, who spoke the Lure language.

We entered the Nile on the second day, and, on nearing Wadelai, found the river narrowed considerably, with a very strong current, which we found it difficult to make way against on our return journey. We camped one mile further on, at Emin Pasha's old fort of Wadelai, which was then completely overgrown. We set fire to all the grass round, as much to diminish the myriads of mosquitoes as to give us a clear field of fire in case of surprise, the natives appearing very hostile. The mosquitoes throughout the journey, at night and in the early morning, made life miserable, and it was a penance to take observations for latitude and longitude at night. After Wadelai, we glided rapidly past narrow channels formed through the floating vegetation and papyrus, stopping sometimes near the villages on the banks to ask for news, which was very unreliable, some of the natives even stating that the Dervishes were close in front. Our guide, crouching down in the

* Paper read at the Royal Geographical Society, November 23, 1896. Map, p. 472.
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bows of the boat, frequently invoked Allah after this, and comforted himself with a long pipe. The further we went from Wadelai, the more friendly the natives seemed to become. They are continually fighting among themselves, and lead a precarious existence. Beyond Eora, an old Egyptian fort on the right bank, the river is very broad—about $1\frac{1}{2}$ mile—though the actual channel through the sand is only about 500 yards in width. There is a large village at Unigwe, under a chief called Abu Suma. The banks between here and Dufile seemed well populated, though the country did not look very inviting. Villages were hidden away among the high rocks and boulders on small hills close to the river, and there was a certain amount of mitama and dhurra cultivation. We could see the high hills behind Dufile in the distance, and late in the afternoon of January 14 we reached the old fort, situated close to the water's edge at a bend of the river on the left bank. The parapet and ditch were still very distinct, and there were some mud-brick houses, some lemon and cotton trees, the only signs remaining of the Egyptian occupation. It was a relief to get on shore, after sitting cramped up on one's tent and baggage, together with a maxim gun, in the stern for no less than ten or twelve hours. We also felt the heat very much after the climate of the Lake districts.

I believe we were the first white men to have reached Dufile, since the abandonment of the place in November, 1888. We walked across from a village called Karas to a bend of the river below the head of the rapids. Here the river was only about 40 yards broad, the banks wooded, and strewn with enormous boulders of rock. The river makes a great bend where it forces its way through the hills, and shortly afterwards dashes down over the Fola catamaras, where, of course, navigation is impossible. The Madi natives are a fine, strong-looking race, and with them we met a representative of Abu Sulla, an important chief living one day's march below Dufile, on the right bank. He was dressed in white cloth, which was probably obtained from the Arabs or Mahdists to the north.

Our return journey to the Albert Nyanza was rather tedious, owing to the strong stream. Near Unigwe we saw hartebeest and some other antelope with short curved horns. There were plenty of water-buck, and an enormous quantity of hippos, especially just above the rapids, where we at first mistook them for rocks. On the eastern shore, up to the Victoria Nile, we could see a fine open grass plain, with scattered bushes, along which some stately giraffe were walking, also some Senegal hartebeest and other antelope. It is difficult to make out the entrance of the Victoria Nile, and there is always a mirage on the horizon. There is a good deal of sand, and many floating islands at the mouth of it. On a second journey on Lake Albert, I visited the fort at Mswa and the west coast up to Mahagi. The lake seems certainly unhealthy to people coming from the high ground, and on returning to Fort Hoima, the

whole of the escort—twelve men—who had been left at Kibero, were very ill with fever. One man died in consequence. I myself was down with fever; the men had indulged in hot sulphur baths while at Kibero, and must have taken a chill afterwards from the cold wind off the lake, which would account for their being so ill.

The people on the west of the Albert Nyanza used to pay tribute to Kabba Rega, but that of course is at an end now. They fight among themselves a good deal. The Shulis in the angle contained by the two Niles are inclined to be friendly. With steamers on the lake, and the railway to the Victoria Nyanza, a large extent of country would be opened for trade, and there is no limit at present to the ivory to be



VIEW OF LAKE VICTORIA FROM MIRAN, SANDI COUNTRY.

obtained from the countries bordering the Albert. There is no hindrance to navigation down to Dufile.

Soon after our return at the end of January, it was found that Kabba Rega had broken the truce concluded in December, that his envoy had run away, and that he had raided the country south near Toru, killing friendly chiefs, so that hostilities broke out again. I accompanied three expeditions during the next seven months, and I was enabled to survey the whole of Northern Unyoro, including the course of the Victoria Nile from Lake Ibrahim to the Murchison falls; also a part of the Lango or Wakedi country. The surveying was carried out under a certain amount of difficulty, as the country was hostile, and one always had to have an escort.

On our return we heard that Mr. Jackson was now the acting commissioner, in place of Colonel Colvile, who had been very ill, and started home.

The most notable landmark in Unyoro is Mount Fumbi, which is

three-quarters of a mile long, and about 150 to 80 yards in breadth at the top; it has precipitous sides, covered with grass, low trees, and shrubs, and is 762 feet above Masindi fort, the present headquarters, and 4640 feet above the sea. It can be seen distinctly from most parts of the country, even from close to the Murchison falls. From the top of it one has a magnificent view over the country, which, however, looks decidedly disappointing; the dull green of the swamps preponderates; bits of yellow here and there mark the mtama cultivation, intermingled with banana groves, especially to the west and north-west, which is very thickly populated. Close to the east, between the Kisoga line of hills, lies a small lake fringed with papyrus, from which rises the river Katagurakwa, that flows through a narrow gorge in the hills, and across a flat plain covered with low trees to the Kafu river. Far to the north-west several hills stand out, among which the Gisi peak is the most noticeable. The ground slopes gradually down towards the lake in gentle undulations. The valleys, in the immediate vicinity of Mount Fumbi, are very fertile, and covered with quantities of Indian corn, dhurra, mtama, tobacco, sessem oil, and bananas plantations. The castor-oil tree is also often found. This hill is used as a refuge in time of war, and we found some tusks of ivory hidden away on the top, one of them weighing no less than 164 lbs. Kabba Rega is still supposed to have a quantity of ivory concealed in the swamps and rivers.

In the first expedition we left the high ground to our left, and found the road as far as Kangara hill very bad indeed; we had to cross two deep swamps, one called the river Tabashari. After this the country became more open, and covered with nice short grass. The road appeared very well used, and led along the base of the ridge, running north-east from Katonezi to the gorge at Kisoga, where there was a very well posted ambush of Wanyoro. This district was under a chief called Mbogo, who with Irata, another important chief, have now retired with their king into exile in the Iango country. We marched away over the waterless plain round Kaduku hill, another very prominent landmark to the Nile, which we joined near Kunguru island. The country here is very flat and open, and dotted about with lovely *Borassus* palms. It was hard to believe that the Nile was really in front of us—it looked far more like a great papyrus swamp; and, indeed, it was not till reaching Magia hill that one was enabled to see the water, and get a view of this magnificent river, over 1000 yards broad, and truly, as Speke described it, "a giant at its birth." Here we met Captain Dunning, *U.S.A.*, and Captain Ashburnham, who had made their way with another column by a very good road along the river Kafu *via* Mruli. The former gallant soldier and best of comrades died afterwards, to our great sorrow, whilst we were transporting him and also Major Cunningham, both severely wounded, to our nearest station. I do not think Sir Samuel and Lady

Baker could have execrated the fetid swamps and dense overgrowth more than we did whilst striving to get the stretchers over and across these obstacles.

The river Titi runs into the Nile close to Magia hill, and in rain is quite impassable. In the second expedition we travelled by a higher and much better road *via* Kibugumia and Katonezi, through the same gorge at Kisoga, and across the level dried-up plain to Mruli, where a column with Captain Teruan, D.S.O., and Lieut. Madocks joined us from Uganda.

The road through the hills was the main road to the old capital at Rumpara, and Kabba Rega's subjects were certainly obliged to keep the roads in very good order; the old bridges across the swamps, made of palm trees, were still standing. We found a small village called Chagwo in the plain, where the water was very bad and scarce.

Mruli used to be the old capital in King Khamrasi's time, in 1864, and has always had a certain importance from being on the main road to Uganda. This was the most southern post occupied by Gen. Gordon, and I saw the site of the old fort on the right bank of the Kafu. It is low and unhealthy, and there is a great deal of mud along the banks of the Nile here, which is also continually blocking up the mouth of the Kafu, only about 30 yards broad. A few miles up the Kafu there is a fine grass plain on both sides, where there are to be found elephant, kobus kob, Jackson's hartebeest, also smaller antelope. The river there is a nice running stream between steep banks, and several villages and banana plantations are scattered about in the distance.

The Nile at Mruli is about 900 yards broad, and had distinctly risen since I was there in February, and one was able to see the water over the papyrus. We heard afterwards that Lake Victoria had risen considerably, which would have accounted for it; in fact, the pier built by Colonel Colville at Port Alice was completely covered with water.

After considerable opposition, the passage of the Nile was forced at Mruli, and the force crossed to the other bank, which is pretty steep, and at first gives one the impression of being an island. Canoes had been brought overland all the way from Lake Victoria, in sections, and the ribs were then sewn together. The Wanyoro do not understand making these canoes themselves, and only use dug-outs, made principally of the palm trees. Mr. Grant brought some canoes down the river from Namionjwa, one of which was called the flag-ship. It was hewn out of a single tree, and held easily fifty men, with a maxim gun in the bows.

We were now in the unknown Wakedi country, and made our way along the right bank of the Nile. The country was thickly wooded with very fine trees, and 10 miles to the east lay some high hills

between Kalengary hill and the high Mahorsí ridge. I noticed several traps for hippos formed by upright poles with weighted spear-point arranged so as to drop on the animal. There was a lovely bit of country at Kitao, opposite Kajumbura island, covered with *Borassus* palms and shady trees, with a green lawn stretching down to the water's edge. The remains of Kabba Rega's residence, which he had well chosen, were still to be seen, and on the rising ground among the trees about a mile off were some Wakedi villages. Our troubles were now to begin, and between here and Foweira we had to cross deep swamps and rivers running into the Nile. No less than seven men were frightfully bitten by crocodiles, two of them about 100 yards behind me. Three succumbed to their wounds later on from blood-poisoning. A crocodile scare occurred very easily after this, and it was alarming to see the great mass of people swaying from side to side in the deep water in their endeavours to get out of the way of the supposed crocodile. Our next camp, Kosoka, was situated between the river and a curious hill called Kibuze, on the top of which are strewn large blocks of granite. This hill can be seen from Lake Kioja. On reaching Niamabare, I followed the course of the river Lenga for some way on a flying column with Lieut. Madocks. This is a large river, which, according to a Wakedi prisoner, extends for a long way inland. We passed through several large villages, which consisted of a quantity of big cone-shaped huts, with a curious entrance forming a porch about 3 feet in diameter. The interior of the huts was in some cases painted white, and ornamented with rough patterns. They had no protection in the form of a fence round, and apparently the people live in peace with each other, although they do not owe allegiance to any one man, and each village is quite independent of the other. This fact would make it rather difficult for any expedition entering the country, as, although some villages might be friendly, the others could not be depended upon. The people grow large quantities of mtama, dhurra, sweet potatoes, sesame oil, tobacco, beans, etc., and have plenty of honey. They possess few cattle or sheep, but a great quantity of dogs, usually about the size of a fox-terrier, and a yellow colour. The country is covered with low trees and bushes, and grass about 3 feet high. The people, as can be gleaned from their name, Wa Kedi, which means naked people, wear absolutely no clothes. They are a small race; the men have the centre teeth of the lower jaw taken out, and some have beads sewn on to a tuft of hair at the back of the head. They are a formidable race armed with spears and poisoned arrows, and are fond of attacking at night. Some days to the north-east along the Lenga is a country said to be full of camels, donkeys, and ponies, and a people wearing gold ornaments in their ears. The people north of the river Dakhi seem to be quite different, and have walled villages. This river runs into the Nile at Foweira; the current is very rapid.

and a large Waganda canoe was upset when trying to cross it, which resulted in the drowning of a very nice chief and about ten men.

We recrossed the Victoria Nile at Foweira, about where Sir Samuel Baker crossed in 1872, and although the river is about 500 yards broad in the open, and there is a strong stream, nearly all our two thousand cattle captured from Kabba Rega swam safely over. Navigation ends soon after this, when the Nile begins to dash down over the Karuma falls in a succession of rapids to the Albert Nyanza. In the angle contained by the Nile here the vegetation is very thick, and there is dense grass about 14 feet high, also what may be described as thin forest. A most wonderful old woman, wife of Khamrasi, the former



MURKISON FALLS, VICTORIA NILE.

king of Unyoro, and mother of Kabba Rega, was captured on this expedition, with several members of the royal family, by Captain Ashburnham. She had escaped being thrown with the remainder of Khamrasi's wives into his grave as described by Baker. She is enormously fat and unwieldy, and is always carried about on an angareb (bedstead). She is reported to be very bloodthirsty, and used to think nothing of ordering fifty people to have their heads cut off in her own district, which used to extend south from Hoima to Bugoma. The royal family will not eat potatoes or bananas, and as women in Unyoro will not eat chickens or sheep, she is rather difficult to feed. However, as long as she gets plenty of pombe, which is the intoxicating spirit made from bananas, and plenty of milk, she is quite happy. It was curious to see in what awe the Waganda people seemed to be of her, and

I have heard the chiefs say that not one of them would dare to touch Kabba Rega even if they came up with him. We marched back from here to Masindi, where a strong fort was built, about $1\frac{1}{2}$ mile due west of Mount Fumbi, and a little east of Baker's old fort. It is exactly in the same latitude as Kibero, namely, $1^{\circ} 41'$ N., and Mruli is in $1^{\circ} 39'$ N. This is our most northern line of occupation; the whole of Unyoro has now been definitely declared to be in the Protectorate.

On our return to Hoima, we found that they had been having exciting times there with lions, which had carried off several people. The natives all said they had never heard of lions there before; they fortunately went away from Hoima after this, but took some women and children from Kitanwa in July. The grass huts proved little obstacles to the lions, who used to scratch their way through, and then seize the inmates.

I must now turn to Southern Unyoro, into which I was sent with two companies of Sudanese to attack the Arab slavers, whilst Major Cunningham was laid up with a severe attack of hæmaturic fever, the most deadly of all African diseases. Starting from Fort Hoima, we steered at first a little west of south on Maaga Ncasi, a high conical hill, round which there is a great deal of cultivation, and then through Misriandura, past the left of some high hills, which form the gate of Bugoma. This latitude, $1^{\circ} 13'$ N., was the most southern point reached by Baker in his route from Mruli to Vacovia, when he discovered the Albert Nyanza. We then crossed two big swamps, the headwaters of the Kafu, which can be seen winding away in the distance.

After passing over some fairly open rising ground, it is curious to find, 5 miles further on, a river about 30 yards broad, and, at the time we crossed it, 4 feet deep, running off in the opposite direction towards the Albert Nyanza. This river is called the Ravasanja, and would be impassable during the rains: it rises in the same swamps as the Kafu. A very well-kept road led from this point to the Arab station at Mwenda's, which we had the good fortune to surprise and capture, and where many slaves were found; also a quantity of gunpowder, arms, ivory, and a great quantity of cloth. I may mention that these Arabs had been in the country for some years, and it was on them Kabba Rega depended for his supply of gunpowder and guns in exchange for slaves and ivory. One woman told me she had been sold for three goats, with one goat extra for her child.

The country between Mwenda's and Kisiimba is very fertile, and covered with banana plantations and cultivation. After crossing a deep swamp and river called Embaya, the country alters entirely, and one enters a line of rugged hills, covered with blocks of granite in curious and fantastic shapes. Streams rise in these hills, which rapidly become papyrus swamps. Passing through a gap in the hills, we gradually ascended to a high mountainous plateau, where there is a big village called Bianja. Further on we reached the Mtsi river, which

drews to the west, turning and twisting through the high rocky hills on each side of it. We could see the Nakabimba fort, just built on a high hill south of the Masi by Mr. Foaker; and to my delight and astonishment, who should come down to meet me but my former adjutant and brother officer, Captain Pulteney, whom I certainly did not expect to meet in this wild part of Central Africa. Mr. Foaker said he had seen the snow on Ruwenzori three times during the six weeks he had been there, but I was unlucky enough not to get a good view of it.

The fort is in latitude $38^{\circ} 24''$ north of the Equator, and is 4582 feet above the sea, and it was naturally much colder and fresher. It is a wild and rugged country, but there are a good many Wanyoro living in the valleys among the hills. The Masi in rain is very deep; it is crossed by means of a causeway made by bundles of papyrus heaped one over the other. I returned by a different route as far as Mwenda's for the purpose of surveying, leaving the granite hills at Bwyaga. Here we were almost on the watershed, and the ground sloped down to the Albert Nyanza on the west and north-west.

The territory between Hoima and the Masi river used to be under the chiefs Rabadongo, Chikakule, Abaswese, and Mwenda, who have been hostile so long; they have all come in to make peace now, and the two former were at Kampala at the beginning of this year. The people have settled down, and are making roads and cultivating their fields. They are not so civilized as the Waganda, and their huts and villages are not nearly so neat. They make the same bark cloth, and dye it black by putting it into the mud of a swamp for one day, and then leaving it in the sun. Their musical instruments consist of primitive stringed instruments, drums, horns, and whistles. They believe in a god called Itabanga, to whom they sacrifice goats, chickens, etc., in case of severe illness or at the time of war, and there are medicine men called Ubandwa, who perform magic by killing animals, or using the leaves of plants. They used to try and bring disaster upon us by burying a sheep with its throat cut and head just out of the ground, also by leaving a chicken in an earthenware pot on the pathway; the Sudanese were always chary of going near these. After a funeral, the relations of the dead man sacrifice a goat, and are supposed to remain in the house for a period of seven days; and when a king died, there used to be a general slaughter for one day, when most of the inhabitants hid themselves as far away as possible. The men and the women are great smokers, and make very good earthenware pipes, also very good pottery.

The jiggers were a perfect plague in this country, though they are now making their way towards the East Coast of Africa. Besides various kinds of grain, beans, sweet potatoes, bananas, yams, etc., sugar-cane is grown in some places. Locusts form a certain food-supply, and white ants are eagerly sought after. The natives prepare coverings of straw on the hillocks where they are to be found, and capture them by means

of fire at the period of their transformation into winged insects. During a long night march we undertook to surprise Babadongo, the king's katikiro, at Misriandura, and a force of Wanyoro and some Arabs, we were astonished about 1 a.m. at seeing fires in all directions, and at once concluded that our column had been detected, and that these were watch-fires to announce our approach. The country was hilly and thickly populated, and these fires made a very weird effect. It turned out afterwards that they were only the fires made to capture the white ants.

The climate of the uplands of Unyoro is a fairly good one, and is, I think, drier than that of Uganda. The maximum temperature registered at Fort Heima, during the time I was there, was 89°, and the minimum 49°; as a rule, the thermometer did not go below 60° at night. The rains are very variable. In September, October, and November there is usually most rain; and July was the coolest month. There will be a great demand in this country for cloth, European clothing of all sorts, boots, shoes, etc.

In September I received orders to proceed to Uganda with a company of Sudanese from the Unyoro garrison, to take part in the expedition against the Nandi tribe east of Lake Victoria, who had been cutting up caravans on the main road to Uganda, and had also treacherously murdered a trader named West. I returned by a different and most excellent road by Mruli, and along the Victoria Nile to Lake Kioja.

On arriving in Uganda, I found that Mr. Berkeley had become commissioner, and was now at Port Alice. Kampala, under the charge of Mr. George Wilson, was in a very flourishing condition; the size of the town had increased, and was increasing daily, all the people seeming very happy and contented. An interesting event happened while I was there, which was the arrival of Bishop Tucker's large caravan, with which were five missionary ladies, the first who have ever reached Uganda, and I am glad to say that they all arrived in good health after their arduous march. There was great excitement among the people, who went in crowds to meet them. Bishop Haulon and the English Roman Catholic mission had also arrived lately, after an adventurous march, and have established themselves on one of the high hills of which Mengo is composed.

We started from Kampala with the troops for the Nandi expedition on October 14th, and marched round the lake, through Usoga and Kavirondo, crossing the Victoria Nile at Jinga. After a few days' delay at Mumia's to make the necessary preparations, we marched along the usual caravan road as far as Kabras before entering the country. There is a small dépôt here, garrisoned by Sudanese, which has to supply the Guseso Masa fort with food. The great obstacle to transport has been the total absence of food between Kikuya and Kabras, a distance of

twenty-two days for a loaded caravan going up country, with the exception of the Eldoma station, which has only been made latterly, and is unable to supply caravans with food. In addition to this, the difficulties had been increased by the Wa Nandi being hostile, and waylaying caravans on the main route between the top of the Man escarpment and Kabras, in consequence of which the Guaso Masi post had been established.

We could get very little information about the Nandi country, and had to trust principally to two Wa Kwavi, who had been in the country years before; to a Zanzibari porter, the sole survivor of West's party;



MORNDI FORT, UNYORO, MOENT TUMBI.

and a Nandi woman, who had fallen in love with him, and helped him to escape. He had been sent into the country by West for the purpose of trading, and was away at the time of the massacre; he was then taken before the Laibon, or head medicine man, and kept a prisoner, until this woman left her own husband, children, and country, and assisted him to escape. The man had picked up the language in a very short time.

From where we turned off the caravan-road, a high black wall of mountains could be seen in front of us, running from north to south, when it becomes less perceptible. The upper slopes were covered with dense forest, which in some cases extended a little way down the escarpment. We soon left the last Kabras villages, in one of which the

Nandi had killed nine people two nights before, notwithstanding their high mud wall and deep ditch. Two of the Kabras natives came with us a short way to show us the path, but none of them would venture to accompany us far into the dreaded Nandi country. After passing through a small belt of forest, and then between some small hills covered with boulders of granite, we reached the place where West and his men were murdered—a gruesome spot, with several skulls lying about, also his table and chair. He had evidently been in no fear of a surprise, and had placed his camp near the edge of a thick wood, and close to a lovely stream of running water, which forms really the headwaters of the Narogare or Lusumo river. There was no zareeba round it, and at the time of the attack the men's guns had been put away in his tent, so that they were powerless to defend themselves.

We afterwards crossed the Anoldamwe and Katumbi rivers, and camped under a high rocky hill known as Kamobir, which is 2 miles distant from the escarpment. These rivers flow to the south, and finally form the Iohuko river.

Our camp was 5260 feet above the sea, and the country to the south-west was undulating and covered with short grass. Here and there were large clumps of forest, in which there are said to be a few buffalo. We saw tracks of these animals close to one of the streams. We marched along the escarpment the next day, where we discovered some small huts and patches of mtama cultivation, the first signs of the Wa Nandi. After several ineffectual attempts to get up, we found a very steep path, which led to an open grass-covered space close to the top, and we camped here at a height of 6332 feet. The column consisted of 250 men, about 300 followers, and 4 Europeans—Major Cunningham, Captain Pulteney, Dr. Mackinnon, and myself, and we used to pack into a thorn zareeba about 80 to 90 yards square. The officers' tents were together in the middle, and the men used to build small grass huts all round. This night, as I was visiting the sentries at midnight, a fire suddenly broke out among the huts of No. 9 company, and spread with the greatest rapidity, doing much damage, fanned by the strong wind that was blowing. The wind increased to a gale, and when morning broke it was intensely cold. The Zanzibaris and Lendu porters were stiff with cold, and could with difficulty carry their loads. Fortunately, they are the most light-hearted people, and soon became good-humoured, and began to chaff each other. It was found impossible to get through the thick forest in front of us, and we had, with disgust, to retrace our steps and make our way right down to the bottom of the steep hills again, and ascend by another route. This time we found a native track through the forest, and, passing over an altitude of 6350 feet, reached some scattered houses at a place called Samwiti. We then made our way in a northerly direction, through several belts of forest, and over swampy streams to Kimong, and from there east along a grassy spur to

Alagabiet hill, which is one of the main features of the country. Small clusters of huts were hidden away in openings in the forest, and the last village occupied by the Wa Nandi was near Kimong.

We had not seen many of the natives as yet, though poisoned arrows had been fired at us in the forest. I made the height of Alagabiet hill 7128 feet, and from the top of it one had a very good view over the valley of the Guaso Masi river, and across a very open country to the eastward, which is uninhabited. Hartebeest, water-buck, and oribi are to be found there. The country immediately south of Alagabiet is very swampy, which is caused by the streams running down this way from the forest, and we had to retrace our steps along our old road to



WANYORO CHIEF AND FOLLOWERS.

Samwiti. Captain Sitwell and Mr. Foaker were with another column working in this direction, which, however, unfortunately missed us, and passed along the lower ground towards Kabras, down south to Kitolo'a.

From Samwiti we steered straight for a high bluff called Usun, to the right of which there appeared to be a gap in the long line of hills in the far distance. The villages were now becoming more numerous, and there were cattle-tracks in all directions. There was still a good deal of forest about, belts of which run out from the main forest to the south-west. The weather was usually dull and cloudy, and there were occasional showers of rain in the afternoon and night. The natives first tried conclusions with us on the open ground east of the river Kimonde, which is about 6 feet deep, and crossed by a native bridge. There were two large bodies of them, from four to five hundred strong.

armed with big spears and shields, similar to the Masai. They seemed excellently organized, and, formed in three sides of a square, charged with tremendous dash almost on to the Sudanese, who received them with a very heavy fire. It was a critical moment, but luckily the Sudanese stood firm. Several of our men were killed this day, whom we could ill afford to lose.

The Nandi are a fine-looking race, very black, strong, and muscular. They dress their hair like the Masai, and are fond of covering it with red grease, also their bodies. The warriors wear big head-dresses made of monkey or goat skins, ornamented with cowries, and sometimes a sort of leather cape slung over the shoulder. They are great workers in iron, and we passed a very large smelting-furnace near the Kimonde river. Their huts are small and circular, lined with clay, and are scattered about the country without any protection whatever, showing that they have never had anything to fear from their neighbours. The women resemble the Masai very much, and distort the lobes of their ears, as a rule, with large pieces of wood. They wear a great many iron wire rings round the arms and legs. The spears are not so well finished, and the shields are not so finely ornamented, as the Masai ones; the latter are very heavy, and painted a dull red colour, as also are in some instances the spears.

About 8 miles beyond the Kimonde river we crossed the Anai river. After crossing the river, we reached a fine open country with rolling hills covered with many huts. The district is called Kiture, and is a very populous one. There is fine pasturage for cattle, sheep, and goats, of which there were many tracks along the paths leading down to the river. Further on we crossed two channels of the river Kaimoen by means of native bridges. The latter are made with big trees, and are quite the best I have seen made by natives, and our cattle, etc., were able to cross by them. My faithful companion, the pony, was still with me, and did better in this country than in any other. When suffering from jiggers in Unyoro, I do not know how I should have got on without him, though I could not take him with me always. There was a piece of bloodstained cloth hanging on the bridge, which was probably meant as a defiance. Several bodies of armed natives showed in front and on the flanks, and the column closed up and advanced very carefully to prevent the large crowd of porters and Sudanese followers, which are such an encumbrance, from being charged. Away to the north-east there extended a bare open plain, uninhabited, and with hardly a tree on it. We had been gradually ascending from 6627 feet at Samwiti to over 7000 feet, until we came to the end of the plateau, where there was a precipitous drop of nearly 1000 feet into the valley beneath. The blue waters of Lake Victoria could be seen to the south-west, beyond the plain which runs down to Ugowe bay, and to the south again the country appeared hilly and mountainous.

From a high hill called Teito the view was magnificent, and I was able to fix the position in longitude very accurately by bearings on Alagabiet hill and Eldalat hill, which bore $345\frac{1}{2}$ and 350° respectively; I also took observations for variation of the compass. A good path led down to the valley, and it was quite like going from winter into summer. There was a great quantity of cultivation, principally mtama, which was ripe, and also a few sweet potatoes, which we had not yet found in this country. We ascended gradually again up the valley towards the gap, until the high bluff called Usun was close to our left. On reaching this point, which is called Kabarer, or Kamwentowe, we found a deep ravine in front of us, and on the far side there were what looked like a series of buttresses jutting out from the Mau escarpment, and the country looked very rugged and mountainous. Below us lay the Sagane river, which works its way almost from the very edge of the mountains through a lovely valley, completely enclosed by enormous hills, to the north called Engoroboby, and to the south Tinderait.

We descended by a steep path under a cliff, and some natives amused themselves by throwing down rocks, which came hurtling over the heads of the caravan. Fortunately only a few were thrown, and only three men were injured by splinters. We reached the Sagane river in one hour, at a point 5352 feet above the sea; it flows through a gap in the hills to Ugowe bay. There were a good many Nandi living in this valley and on the hills around. At the head of it we commenced the ascent of Mau by a native track through the forest, which commences almost immediately. We got among the bamboos near the top, and eventually camped at an altitude of 8900 feet, in an open space surrounded by clumps of bamboo forest. The difference between this point and our camp in the Sagane valley was 2860 feet, and it was a hard climb for loaded porters. The top of Mau consists of an undulating plateau, broken up in places by deep ravines, covered with short grass, and in places by clumps of forest. There are no inhabitants on the top of Mau, except some occasional Wanderobbo hunters, and the few tracks we saw were the paths used by Nandi raiding-parties. Although at this height, we were not safe from the Nandi, who hung round the column, and one woman was killed and another wounded, when going out a short way to draw water. It was very cold, and wretched for the men, and we usually had a cold sleet driving in our faces when on the march, also accompanied by a dense mist. We entered a series of small valleys, and had to cross several swampy streams, passing also a small lake. Some Jackson's hartebeest were seen, and there were also a very few tracks of buffalo, rhinoceros, and elephant. Our highest camp was 9100 feet above the sea, and from here we had to cut our way down through thick forest to reach the Uganda-Mombasa road. We spent nine hours cutting continuously, and I never was so glad as when we emerged on to the caravan road at a point called Campy ya Mwiba, or by the Masai Ngare

Lekonge, about 7 miles north-west of Eldoma ravine station. At this time I had fifty men with me, and was much hampered by having to carry two sick men on stretchers. It was nearly dark, and the prospect of having to spend the night in the forest without water was not a nice one. There was great delight among the Zanzibaris when they recognized the spot, as I think they had long given up the idea of ever reaching the road.

We reached Eldoma the next day, November 24, where Mr. Martin had built a very strong fort, situated on a hill not far from the ravine, from which, on a fine day, Lake Baringo can be seen flashing in the sunlight, and a lovely view obtained across to the Leikipia range. There is a very fine waterfall at the east end of the ravine, which divides into two channels. This was the furthest point the soldiers had yet been from their native country. This district is now under Mr. Jackson, who was for so long acting commissioner after Colonel Colville left. A great quantity of food has been planted, and Masai are being induced to settle round. The opening up of the Nandi country will make a great difference to this station, as it is only two days to the fertile Sagano valley, where quantities of food can be obtained. The headquarters of a company of Sudanese are stationed here, under Hussein Aga. Our return journey was much easier, owing to the road being out through the forest, and I was soon able to rejoin the main column at Mitele, to the joy of my men, who were glad to leave the bleak and inhospitable Mau plateau and bask in the sunshine again. Just before the descent the sun came out, and a lovely panorama unfolded itself. Looking down over the dark green forest, which extends and becomes thicker to the south, the different valleys could be distinctly traced leading to the great plain; the rugged hills near Usun showed up plainly in the foreground, and over them again the waters of the Victoria Nyanza. The next day we climbed up to the top of the range of hills known as Tunderait, and travelled across an open and very hilly country inhabited by the Wa Nandi. We were much delayed by small streams and rivers running down from the mountains, and we eventually camped on the third day close under the Endabo mountain, on a range running down towards the valley of the Nyando river, called by the Masai Kedowa, or Merto. There were a few people living on the mountains close, but this is about their limit, and there were no houses in the plain south or towards the lake. It is 59 miles from here to Lake Nakuro, and the Masai with us said there was a fairly good track over the mountains, and that it was open until the descent through forest on the further side. I fancy this track would bring one out close to the Guaso Masai river, and of course, if it could be used, it would shorten the route from the East Coast to Lake Victoria very considerably, as there is no difficulty in going along the Nyando valley to Ugowe bay, where there is a harbour.

We marched in a westerly direction from here into the big plain at a level of 4000 feet, which is covered with short grass, and a few thorn bushes and small trees. There are no inhabitants until one approaches the lake, when there are several villages belonging to a chief called Kifoto. Towering over the plain to the west rises the great Nandi escarpment, which runs right down to Ugowe bay, and then round by the Wa Tiriki and Maragotia hills. It was very hot and steamy in the plain, and there were thunderstorms in the evening and night. We crossed the river Enolgotwe, flowing between steep banks, and 4 miles further on reached the base of the hills, where we found a very well-marked road, evidently used by the Nandi to drive their cattle and



GUANO MARK PORT, NANDI COUNTRY.

flocks down to graze. We climbed up to the top of the plateau again, over 2000 feet, along a small watercourse, and on arriving there found the hills covered with boulders of granite, and very bare. There was a dense mist most of the day, and it was very cold and damp. The country reminded me exactly of Mr. Rider Haggard's description of the unknown country in his book 'The Children of the Mist,' excepting that we failed to find the beautiful princess, and were received with poisoned arrows instead. The poison did not have much effect when the arrows were taken out at once, and, under the skilful treatment of Dr. Mackinnon, the patients nearly all recovered.

About 9 miles from the edge of the plateau the forest begins. We travelled along it for some way before entering it, which we did by a very bad path, frightfully muddy and steep in places. This road brought

us out at a place called Kavaren, 6000 feet high, where we camped on rising ground near some small hills covered with blocks of granite. There were still a good many Nandi here. A belt of forest about 5 miles broad separates them from a large Kavirondo tribe called the Kabalusia, and it was curious to emerge from the forest into this populous and most fertile district, inhabited by an entirely different type of natives, thick lipped, curly hair, and very ugly. On all sides there extended fields of intama, telebone, potatoes, and banana plantations. The people wear small skins, and I noticed an old Kavirondo woman with a stone fixed in her chin by way of an ornament. The people had a good many cattle and sheep, and must pay a large tribute to the Nandi. Between these people and the Kakamega, another section of the Wa Kavirondo, we crossed the river Rukus, or Rukuse, a very fine river 25 to 30 yards broad, which flows through a gap in the Nandi escarpment, after it has received the Kimonde, Amai, and Kaimin rivers, and flows into Lake Victoria. We did not arrive among the usual walled villages of Kavirondo until we reached the Asori people, not far from Mumia's. The whole country between Nandi and Mumia's, where we arrived back on December 9, is densely populated, and very fertile. The caravan took four hours to cross the Lusumo river by means of a creeper bridge. There was a very strong stream, but the cattle and donkeys managed to swim across further up. One of the donkeys was swept past us down the rapids, being tossed about among the rocks, and we were astonished and pleased to find him alive at the lower end of them. The river is full of crocodiles, and one of the people from the fort was carried off in the act of drawing water at the crossing. At Mumia's we joined forces with another column under Captain Sitwell, and on December 14 started into the country again by a route a little north of the one previously taken.

The Nandi are ruled by a medicine man called the Laibon, who lives near Moran, close to the edge of the plateau. Under him there are several *Leigumania*, or leaders of bands. The people consult the Laibon in everything, and he advises them as regards their expeditions and war-parties. I am afraid he has rather lost his reputation since we entered the country, and the last news was that he had been obliged to leave the country hurriedly. He told his people that they had got nothing to fear from us, as the powder would soon get damp, and then our cartridges would not go off. The Nandi war-parties have been in the habit of raiding the country far to the north, and, similar to the Masai, their custom is to attack at night. The people speak the same language as the Sotik, Lumbwa, and Kamasia peoples, and intermarry with them. They are also friends with the Kabalusia, Kakamega, and Wa Tiriki people.

The Nandi country lies at an average height of over 6000 feet above the sea, and is excellently adapted for colonists. There is perfect grazing

ground, and the people have large numbers of cattle, sheep, and goats. I had my pony with me the whole time, and he was never sick or sorry. The soil is very fertile, except in the northern portion beyond Alagabiet, where it is stony and barren. The climate is a very good one; it is cold at nights on the high ground, and the thermometer rarely went over 80°. There was a good deal of rain at night when we were there. I am glad to say that before our departure the Nandi had made peace, and sent in presents of ivory. What surprised them more than anything was the fact of the Sudanese women accompanying their husbands on the war-path. It would be a great shortening of distance if the road, or even the railway, could be run through the Nandi country to Mumia's.



VIEW OF NANDI COUNTRY SOUTH FROM GUARD MASO PORT.

after the ascent of the Mau mountains has been made by the usual route past the Eldama station. At a point on the top of the escarpment the ground slopes gradually down towards the Bukus valley; it is an open slightly undulating plain, until the Nandi villages are reached. A belt of thick forest, from 8 to 10 miles in width, forms rather an obstacle, but after this Kavirondo and a fine open country is reached. Instead of passing through an uninhabited desert as at present, a cultivated track would be reached very soon, and the district between Nandi and Mumia's is the most food-producing centre of this part of Africa. With a railway from the coast, and steamers on the Victoria Nyanza, timber and fuel will be in great demand, and this Nandi forest will be of inestimable value. Some of the trees are very fine ones, and the supply would last for a great number of years. As will be seen from the map, the forest

stretches a long way from north to south, and the edge of it is not far from Ugowe bay. In Kavirondo, with the exception of Kikelelwa's forest, hardly a tree is visible, and great difficulty is experienced in getting wood. No one realizes what Captain Lugard did for our rule in Central Africa, by going over to the west of Lake Albert, and enlisting these former soldiers of Emin Pasha's in our service. Needless to say that without them it would have been almost impossible to have held the country.

On our return to Uganda, we marched along the right bank of the Nzoia, and through the Wanja country to the Maandi hills, and on to Port Victoria at Berkeley bay. After a short time spent in Uganda, I started home at the end of February, 1896. The roads in the Uganda Protectorate have been much improved, and if once wheeled traffic is introduced, the king and the chiefs will have the roads widened and the bridges repaired for their own convenience. Mr. G. Wilson has a large garden at Kampala, in which all kinds of trees, fruits, and vegetables are doing well. A great deal of rice has been grown lately by the people themselves, and the native coffee is very good. There should be a great future for coffee-planters in these countries. Tobacco should also do very well.

It has been said that it will be impossible to get native labour, but I can only say that at present in Uganda itself the people have been induced to carry loads in the Protectorate, and perform a certain amount of work; numbers of natives bring in timber for Mr. Hobley at Munnia; until the outbreak of Masai, hundreds of Wa Kikuyu were carrying loads to Eldama; and at Machakos they have been induced to work in the fields. Owing to the administration of the country, a cessation of war, and internal strife, the population of Uganda and the surrounding countries is increasing largely. As they become more civilized their wants will increase, and they will be forced to work to supply themselves with the necessities of life. Wonders have been done by the missionaries, and no end of the people are able to read and write. One still sometimes meets horrible objects in the streets without hands, noses, ears, or lips—awful proofs of the old barbarities.

A regular post has been established, which the chiefs avail themselves of to write to each other.

On my way home, I was sorry to see the ravages caused by the locusts in the magnificent banana plantations of Usoga. All the leaves were eaten off the trees, and the people had given up driving them off in despair.

One result of the railway will be that horses and donkeys will be transported rapidly through the belt of country infested by the tsetse fly, lying between the Tsavo and Kibwezi, and ought to reach Uganda in good condition. Animals do well there, if properly looked after, though dangers exist in snakes, and bad grass met with in places. It

is a great pity that a determined effort has not been made to capture young zebra, and to tame and train them for transport purposes. Even in Uganda itself there are zebra, near Lake Isolt, in the province of Singo, also in Buddu and Chagwe. The rinderpest, which killed so many cattle and buffalo, seems to have died out. Small herds of buffalo have been seen lately by government officials in various parts of the Protectorate.

A silver currency has already been introduced, several loads of rupees having been sent up from the coast, and the days of beads and cowries are numbered. An interesting event, on the way down to the coast, was the meeting of a Masai war-party while crossing the Mau mountains. We were expecting the coast mail daily, and made sure that the men coming over the brow of the hill were bringing the precious mail, until the spears glinted in the sunlight, and finally 487 warriors, in full war-paint, as I counted them, filed past our small caravan. They were the same Masai who had massacred the large number of Wa Kikuyu and Swahili in December, not, however, without strong provocation, as found out afterwards by Mr. Jackson. They were divided up into detachments, some with monkey-skin head-dresses, others with capes of ostrich feathers, etc., and all in single file, travelling very rapidly. Some cattle and goats were being driven after them, to provide them with food on the journey to Ingoboto, east of Mount Elgon, to raid the Kimariongo tribe. We congratulated ourselves on their being friendly, and, after a talk with the leaders, who were very anxious for us to go with them, passed on our way. At Naivasha we met Captain Selater and Captain Smith of the Royal Engineers, with a party making the waggon-road from Kikuyu to the lake. Their carts had reached this point from the coast. The road down the Kedong escarpment was nearly completed, having been cut with great labour out of the rock. There were a great many Masai kraals between the Gilgil river and Naivasha, and I met the great chief Tersry with his old father, who weighed 20 stone.

On arriving at the coast, we found a great change had taken place in Mombasa, owing to the railway, work on which had just been begun. A hotel had been started, and shops of all sorts; also a Cook's Agency, which I trust will soon be advertising tours to Lake Victoria and Uganda.

In conclusion, I wish to pay a tribute to my commanding officer, Major Cunningham, who conducted all the expeditions I have mentioned with such skill and success, and who gave me every facility for mapping and taking observations. He is, I suppose, a unique instance of a white man in Africa who does not grumble and become ill tempered when he has fever, and I feel lucky to have had the good fortune to serve under him.

TABLE OF LATITUDE AND HEIGHTS.

	Latitude north.	Height.		Latitude north.	Height.
	° ' "	Fet.		° ' "	Fet.
Buniga camp	0 54 35	—	Bajan	2 14 57	—
Kaduma fort	1 5 56	—	Kibega	2 8 52	—
Baranwa fort	1 14 14	—	Kijango	1 36 37	—
Holma fort	1 26 56	2820	Kikingo	1 32 15	—
Kibero fort	1 41 1	2115	Chikunika	1 16 56	—
Mahagi	2 6 28	—	Kalugala	0 39 7	—
East bank of Nile near Amat	2 26 50	—	Ntebi	—	3820
Wadelai old fort, left bank	2 43 11	—	Mumia's	0 20 6	4421
Dufile old fort, left bank	3 34 21	—	Kikelelwa's (near)	0 21 12	—
Lukwia	1 58 21	—	Kamobir hill	0 22 32	—
Kangara	1 32 28	—	Samwiti	0 18 36	6627
Kajumbura island	1 51 10	—	Kimong	0 25 26	6872
Kilianingo	1 51 45	—	Alagabiet mountain	0 24 49	7128
Kibugumia	1 34 33	—	Kituro	0 10 48	6650
Kisoga camp	1 39 8	—	Taito	—	7119
Mruli	1 35 3	3510	Miteta	0 0 41	6039
Luknogu	1 39 27	—	Olmasidi	0 13 7	—
Kitao	1 50 36	—	Sendege's plain	—	3930
Niambari	2 0 26	—	Paugwa	—	4423
Foweira, near old station	2 11 14	3070	Chibonyai	—	6545
Kirunguru	2 1 2	—	Kwakimilun	—	6445
Dwempinda	1 54 42	—	Kavara	—	5998
Kigia	1 48 47	—	Runya	—	5310
Masindi fort	1 44 5	3878	Slyouao	—	4800
Raymond	0 22 41	—	Kabraa	—	5464
Mwenda's	1 3 15	3733	Moran	0 0 13	6455
Nakabimba fort	0 38 24	4582	Moraba peak	—	6212
Kimona	—	3470	K-villat peak	—	3890
Panlutoli	2 5 44	3690	Thiki	0 1 19	4969
			Marugwa peak	0 1 30	5428
			Chubugumo	0 8 37	4040

MEASURES DISTANCES.

Longitude of Holma, 31° 21' 15" E.

	Interval 4 days	° ' "
Kaduma fort, east of Holma	...	0 7 45
Mruli fort (first observation) east of Holma	6 "	0 42 15*
Kivari (Unyoro)	4 "	0 22 45
Kibana (Unyoro)	3 "	...
Mruli fort (second observation)	9 "	0 43 15*
Niambari, east of Mruli	6 "	0 17 30*
Foweira, west of Niambari	11 "	0 1 15*
Dwempinda, west of Foweira	3 "	0 14 45
Wadelai fort, east of Holma	5 "	0 6 45*
Dufile fort, east of Holma	9 "	0 40 45
Kibero, west of Holma	2 "	0 5 45

* Rate of watch determined at both places.

Before the reading of the paper, the **PRESIDENT** said: 'This evening we are to listen to a most interesting paper by Lieut. Vandeleur, who has been for the last two years in Uganda and Unyoro, and who not only has visited the localities rendered famous by Speke, Grant, Baker, and Gordon, but has also explored a great deal of most interesting country previously unknown. I will now call upon Lieut. Vandeleur to read his paper.

After the reading of the paper, the following discussion took place:—

The **PRESIDENT**: We have the pleasure of welcoming here to-night Major Cunningham, Lieut. Vandeleur's commanding officer, and I am sure the meeting will be very pleased if he will kindly address a few words to us upon the subject of the paper.

Major **CUNNINGHAM**: I should like to say how carefully the map has been compiled by the lecturer. It is not an ordinary sketch, but it is made by observations of latitude and longitude, very often effected under great difficulties; having to watch for any particular star with the mosquitoes round about you is really difficult work. One of the points in the lecture I shall have to draw attention to is about labour in Uganda. They do labour now a good deal, but it is not quite free labour; it is obtained, of course, from the chiefs, and we don't quite know how much pressure is brought to bear upon the peasantry by the chiefs in order to bring them to the scratch. The Maasi, although a source of trouble outside, are quite quiet in our own territory; but they are in the habit of going raiding in the territories which will some day come under our administration. They have seen our expeditions go out to punish people for murder and that kind of thing, and the usual way to punish a native tribe is to take away their cattle; they have, therefore, come to the conclusion that we are cattle-raiders. The result was, that when we met this party going out for a raid, after we had refused to go with them, they asked us to tell them where the cattle were. The Nandi country could undoubtedly be colonized by Europeans, who could live there and rear their children there—more than could be said for a good many of these countries. A great obstacle to the peaceful settlement of Uganda and Unyoro is now removed, as Kalarega now lives on the other side of the country, and nearly all of his people have come back, and will gradually settle down. In conclusion, I will say how well supported I was by my officers and men, the Sudanese especially, and there is no doubt Captain Lugard did a very good stroke when he secured the services of these men from the other side.

Dr. J. W. **GEORGE**: Considering the number of times that Unyoro has been traversed by Europeans, it is surprising how difficult it has been to get any precise cartographic information about it, and many questions of geographical importance await solution until we have a correct map of that district. I should say, from the numerous traverses made by Lieut. Vandeleur, that when his map is published, it will help materially in the study of that district. We have all listened to the paper with great interest, as Unyoro has always been regarded as a political dependency of Uganda; and if Uganda is to be made the key to the upper Nile valley, it is absolutely necessary to get a clear and safe road through Unyoro. In the campaign for the establishment of British supremacy there Lieut. Vandeleur played a very conspicuous part. I am sure every Fellow of this Society will have been pleased to hear Lieut. Vandeleur's tribute to the wisdom of Captain Lugard in introducing the Sudanese into Uganda, as they enabled us to maintain our hold over that country.

The **PRESIDENT**: Sir Harry Johnston is such a very old friend of ours, and we are always so pleased to hear him, that we shall be glad if he will address us to-night, as I think it is likely that, with his knowledge of Africa, some fresh geographical ideas may have occurred to him while listening to this interesting paper.

SIR HARRY JOHNSTON: I won't detain you, at this late time in the evening, with any remarks more than to say how much interested I have been in this paper, because, of course, the greater part of Buganda and, I should say, Bunyoro belong to what may be called Bantu Africa—that is to say, to that portion of Central Africa inhabited by races speaking tongues allied to the Bantu stock. I am particularly interested in the Baganda, as they are generally called in their own country, from the fact that so many have followed me in almost all my expeditions in Eastern and Central Africa. In 1884, when starting for Kilimanjaro, Sir John Kirk entrusted to the late Mr. Stokes the organization of my caravan, having great confidence in his judgment of men, and Mr. Stokes picked out some Baganda who had in some way or other found their way down to Zanzibar, and a few of them are to-day serving the British Government in the British Central Africa Protectorate, having remained with me ever since; they are now settled in Nyasaland, and will probably remain there for all time, still maintaining their Luganda speech between themselves. There is a great community of feeling all along the great lakes, as the people are of kindred origin and not much separated from the parent stock. The language spoken in Bunyoro and Buganda belong to the most archaic forms, almost being the Sanscrit or Lithuanian of the Bantu family. It is to be hoped that, in organizing this Protectorate, we shall endeavour to compile vocabularies of these languages before they are too absolutely corrupted by Swahili, because it would be an immense help in throwing light on the structure of the Bantu group. I almost take for granted that in Buganda and Bunyoro, Swahili, the language of Zanzibar, is becoming the universal language of the country. It is inevitable, as it is, of course, impossible for Europeans to attempt to learn every single dialect. We must have some common language, as in India, where Hindustani is the medium of expressing our thoughts to the natives in such a simple fashion as to be understood, and I should say Swahili is in every way fitted to be that medium, and it is to be hoped—and it is a hope expressed for some years past—that we may before long possess a chair at either one or other of our universities for the teaching of Swahili in a scientific manner, so that officials may arrive with some knowledge of the language, which will enable them to make themselves understood almost anywhere between the Equator and the Zambesi.

THE PRESIDENT: We have to thank Lieut. Vandeleur for more things. I think, than the paper read to us this evening. Lieut. Vandeleur has been well known to us for some time as a good observer. I remember being astonished at the accuracy of his route survey, made with very small means, when shooting lions in Somaliland. He has now done much bigger work, and I feel he is of the stuff of which our gold medallists are made, a man despising dangers and hardships, an ardent sportsman, conciliatory to the natives, and a good scientific explorer. In his paper he has pleased us, first of all, by bringing to our minds the memories of our great explorers of former days, and describing some of the scenes which they visited—of Speke and Grant, of Baker and Gordon. I remember, now many years ago, that Dr. Norton Shaw came to my house with a young officer, who said he believed he had discovered the lake source of the Nile; asking me to go with him to Sir Roderick Murchison, and induce our President to undertake an expedition. Well, that expedition was undertaken at the joint expense of the Royal Geographical Society and her Majesty's Government, which I submit is a most excellent precedent. We heard from time to time from men who went up the Nile hoping to obtain news of Speke and Grant. At length the great explorers themselves arrived, and almost entranced us with the importance of their discoveries and the charming way they described them. We then had equally fascinating accounts of the routes of Sir Samuel and Lady Baker and Gordon. Lieut. Vandeleur

has brought all these things to our minds by visiting the same places. The two most interesting of his photographs were those of the Murchison falls. He has done a great deal more than this, for he has explored countries hitherto quite unknown, especially the highlands beyond the Victoria Nile and other upland countries further to the eastward. We also have to thank him for his interesting photographs, and especially for that magnificent display, the results of his rifle, which has been arranged in the other room—as fine a show of heads as I have ever seen. It is a great pleasure to us all to know that the Queen has commanded both Major Cunningham and Lieut. Vandeleur to proceed to Windsor Castle to-morrow, to receive from her Majesty's hands those distinctions which they fully merit and have so nobly won.

It is for us on this occasion to return our warmest thanks for what they have done in exploring work, and to Lieut. Vandeleur our hearty thanks for the interesting paper he has read to us.

LIEUT. VANDELEUR'S MAP.—The map has been reduced from Lieut. Vandeleur's original drawing. The route from Kampala to Munia is the same as the railway route surveyed by Captain Pringle, and published by the Intelligence Department (see *Journal*, vol. ii., 1893, p. 112). Other additions have been made from Dr. B. Hassenstein's maps, published in 1892 and 1895 in *Petermanns Mittheilungen*.

THE SOUTHERN BORDERLANDS OF AFGHANISTAN.*

By Captain A. H. McMAHON, C.I.E.

I AM going to take you along the southern border of Afghanistan from the Gomal river to the Persian frontier, and will endeavour to describe the country which forms the southern portion of Afghanistan and the northern portion of what is commonly known as Baluchistan.

I purpose to confine myself chiefly to a brief geographical description of the countries traversed by the Baluch-Afghan Boundary Commission, which, as one of the results of the Durand Mission to Cabul in 1893, recently delimited and demarcated the boundary between the territory belonging to the Amir of Afghanistan and that under the government of India, from Domandi, a place on the Gomal river, to Koh-i-Malik-Siah, on the Persian border. The Koh-i-Malik-Siah mountain marks the southernmost point of the boundary between Afghanistan and Persia, as agreed upon by those two governments, after the Seistan Mission of 1872, when General Sir Frederic Goldsmid, assisted by General Sir Richard Pollock, acted as arbitrator between those governments.

The Baluch-Afghan Boundary Commission started in March, 1894, and by June, 1896, succeeded in laying down the boundary-line to Persia. The length of this line from the Gomal to Persia is over 800 miles, and it took us nearly two full years to complete it. To give a detailed description of over 800 miles of country, or of the varied personal incidents of the two years' wanderings of the mission in that

* Paper read at the Royal Geographical Society, February 22, 1897. Map, p. 172.

country, is impossible in the small compass of this paper; and I can only give the general characteristics of the country, with a few remarks here and there on places of more than ordinary interest. In our wanderings we traversed many tracts of country hitherto seen by only a very few Europeans, and again large tracts hitherto unvisited by any Europeans at all.

The general characteristics of the whole country we traversed are, I may say, barren dryness—barren hills and mountain ranges and vast open plains, where, in most cases, either want of water or the unsettled state of the people has prevented the cultivation of the soil. Rocks and stones, varying from the size of the huge gigantic boulders on the mountain-sides to that of the small pebbles and shingle of the strands of the dry torrent beds, cover the greater portion of the surface of the country, while another large portion is given up to deserts of deep soft sand. Throw in here and there springs of water of widely varying medicinal properties and every degree of saltiness, and you have a rough general idea of the country I am describing. To those who indulge in varied mineral waters, and would like to test the varying effects of petroleum, sulphur, ammonia, potassium, either mixed or by themselves, I can recommend them to pay a visit to that country. But they must remember that, unfortunately, none of the springs are labelled, and so you don't know until afterwards what you are drinking.

However, I must not lead you for a moment to suppose that this country has no redeeming features. Refreshing green oases here and there, sometimes in the form of green wooded valleys with rippling streams of pure water, sometimes in forest lands along the high mountain-tops, sometimes in the form of extensive tracts of rich cultivation in wide valleys and plains, break the monotony of the vast wastes around, and afford a relief to the eye and a pleasure to the senses which none but travellers in that country can fully realize. Then, again, the clear, dry, sparkling atmosphere, the deep blue cloudless skies of the greater part of the year, and the almost boundless horizons produce feelings of exhilaration and a sense of freedom which go far to make up for the shortcomings of the country in other respects. Last, but not least, we find the inhabitants a fine manly race, whose love of independence is as rugged as their hills, and whose stubborn bravery is unquestionable. With fair complexions and splendid physique, they form for the most part a magnificent race of men.

On April 5, 1894, our mission reached Domandi, a dreary uninhabited spot 3500 feet above sea-level, at the junction of the Gomai and Kundar rivers, the starting-point of the boundary-line which we were to lay down. Our party consisted of six British officers: Captain R. J. Mackenzie, R.E., was the survey officer; Captain C. Griffiths, 16th Bengal Cavalry, and Captain F. G. Fowler, 1st Baluchas, commanded the cavalry and infantry escort; Surgeon-Captain F. W. Gee was our

medical officer; and Lieut. R. A. E. Benn came as intelligence officer. We had an escort of 150 infantry and 80 cavalry. Our whole party, including escort, survey party, office establishment, and tribal chiefs and followers, amounted to about 1000 men and 600 animals, *i.e.* camels, horses, and ponies. The Afghan commissioner, who subsequently joined us, brought an escort and camp following amounting to much the same number as ours. The Afghan commissioner was Sardar Gul Mahommad Khan, a near relation of the Amir of Afghanistan.

Domandi deserves a few words of mention. Here the Gomal and Kunder rivers meet and form one stream under the name of the Gomal,



KHORASSAN PLAINS, LOOKING TOWARDS DOMHIXA AND KATAWAR.

which, some 80 miles below Domandi, after cutting its way through narrow gorges through the Sulaiman range, issues out on to the Derajat plains of the Punjab. The Gomal has for many ages been a great trade route between Afghanistan and India. The Ghilzai and Lohani tribes, both of whom are commonly known under the name of Powindahs, come down in their thousands year by year in the autumn from the highlands of Afghanistan by this route to India, bringing with them their women and children, and huge herds of camels, sheep, and goats. Over 70,000 camels are sometimes known to be thus brought down in one season. The various tribes which compose the great Ghilzai and Lohani clans, *i.e.* the Sulaiman Khels, Nasirs, Kharotis, Mian Khels, and others, after the manner of Afghan tribes, are mostly at feud one with another, and so they find it more convenient to avoid each other on their march up

and down the Gomal. They have, therefore, a regular order of going fixed by long-established custom, and according to this order they move down tribe by tribe each autumn from the highlands of Afghanistan to the plains of India. When the heat of the Indian spring sets in, they all turn their faces homewards, and tribe by tribe, in the old-established order, they wend their way up the Gomal again to the cooler regions of their summer highlands, which they know by the general name of Khorassan. Above Domandi, about half of them continue up the Gomal river, and the other half takes the more western route along the Kundar river. Lieut. Broadfoot, in 1839, travelled in disguise from Ghazni with a Powindah Kafilā to India, and an account of his adventurous journey is to be found in the earlier records of this Society. He is the only European who had ever been along the Gomal route above Domandi.

The journey of these Powindahs is not a peaceful one by any means. The Waziri tribe, whose country fringes the Gomal route from the plains as far as Domandi, have from time immemorial laid in wait for these passing caravans, or kafilas, as they are called, and year by year have exacted their tribute of blood and loot from any caravan that, from inferior numbers or want of precautions, may have offered an opening to their ever-watchful enemies.

At the time of our stay at Domandi in 1894, the Waziris were making themselves particularly objectionable. The yearly exodus of the Powindah tribes from India to Afghanistan was at its height, and kafilā after kafilā of these tribes used to pass our camp, all with the same tale of woe—so many men killed and wounded at one place on the road, and so many camels carried away at some other place by the hated Waziris. To see these large kafilas passing, as we did, day after day for many weeks, was a very interesting sight. First of all came their advance party of fighting men, armed to the teeth with guns, pistols, swords, and shields, those on horseback often armed with a long lance in addition to their other martial equipment. With these march their musicians with drums and sirinais, which are a rather pleasing kind of reed instrument. Every now and then one of the footmen breaks into a dance, singing at the top of his voice, and spins round and round waving his sword and rifle; another and another join in, and they dance madly round until exhausted or the rough nature of the ground makes further dancing impossible. On approaching the place where they intend to camp, music and dancing are renewed with redoubled vigour, and often continued until the ladies of their household, who are following behind, have arrived, and have erected the tents and arranged the belongings of their lords and masters. After the fighting men come long strings and strings of camels, donkeys, and cattle, sheep and goats, accompanied by more fighting men, and crowds of women and children. All except the men are laden with something—the camels with heavy loads of merchandize or household belongings, others with gaudier trappings carrying

the women folk of the wealthier men; and you see women staggering along, one with a child on her back, another with a lame sheep under her arm; children carrying smaller children or kids or lambs. Then come the donkeys and bullocks, some with loads, others with children and babies roped face upwards on their backs. One by one, as they reach the camping-ground, the women and children unpack their belongings and set up their tents; the latter is not a difficult process, as it only consists of setting up four sticks and draping coarse black goat-hair blankets on the top and round the sides. Then the boys and a guard of well-armed men drive off the camels and flocks to graze on the adjacent mountain-



ZAMEELAN PLAIN AT DOMANDI.

sides, while the remainder lie down in the shelter of trees and rocks and lazily watch their women folk laboriously fetching water and cooking the mid-day meal.

There is one feature about the Powindahs' return journey to Afghanistan which makes it preferable, if you have the choice, to march with them on their autumn march to India rather than with them, as we did, on their return march to Afghanistan. What I mean is this, that all those who die on the march down or during their winter stay are buried, but many of them are dug up again on the return journey and carried home to be interred in Afghanistan. If you see a camel coming along with long suspicious-looking boxes on his back, you know they contain some defunct Powindah making his final journey to his last resting-place.

We stayed at Domandi some three weeks, and while there our presence ensured the protection of the passing kafilas, and we ourselves

were fortunately left alone by the marauding Waziris, who were too busily and more profitably employed in attacking and looting the Powindah kafilas further down the Gomal river. In this we were fortunate, as our small camp would have fared ill in a fierce, sudden night attack of the nature which was made on the brigade under General Turner a few months afterwards at Wano, a place only some 30 miles from Domandi, during the subsequent Waziri expedition, when a force was sent into their country. The Waziris did, it is true, some while after our departure from Domandi, send, as a sort of after-thought, a large picked raiding-party after us; but we had by then got too far from their country, and through want of food they had to return before getting within striking distance of us.

We marched thence up the Kundar river, for the most part a dry river-bed in a confined narrow valley between high mountains, some 9000 feet high. The force under General Sir George White marched down this river in the Kundar Sherani Expedition of 1839.

Very interesting natural phenomena to be seen in this valley are the mud volcanoes at Khut Kanda.

These curious volcanoes are situated on a neck of high ground on the south bank of the Kundar river. We saw some ten or more craters, large and small, in activity, and all round were a large number of dry craters of inactive volcanoes. These craters vary from 2 to 30 feet in diameter inside. It appears that, while the active craters are constantly drying up and become inactive, new active ones suddenly make their appearance close by. These volcanoes are of a thick liquid mud, which comes bubbling up from below, and every now and again surges over the crests of the craters. The mud deposited by this overflow forms into the hard rock of which the outer slopes of the craters are formed.

After some two months in the Kundar valley, where the heat and bad water seriously affected the health of our camps, we gradually proceeded onwards up the Kundil and Sharan Toi rivers, ascending into higher and higher levels until, by the end of June, we reached the highlands of Khorassan.* Here we found ourselves in country hitherto unvisited by Europeans, up in high open sandy plains varying from 6000 to 7000 feet above the sea—in the summer grazing-grounds of the Ghilzai Kakar tribes.

These wide plains are intersected here and there by long mountain ranges of no great height above the level of the plains, but some 8000 to 9000 feet above sea-level. Here hill and plain alike are covered thickly with a small bushy plant about 2 feet high, called by natives *tirkha*, and known to botanists as southernwood, or *artemisias*. Its pleasant perfume pervades everything, and its forms the staple grazing

* Major Isaac MacLvor, M.E. Political Agent, Zhob, traversed a portion of this tract as far as Tirwa in 1892.

food of the huge flocks of camels and sheep which the Ghilzais and Kakars bring up here in the summer months.

We have now reached a tract of more than ordinary interest, as we have ascended to the western watershed of India—I mean the watershed which divides the drainage flowing into India on the south and east from the drainage flowing into Afghanistan on the north and west. You will see, from the map, that all the water that flows from here to the north and west flows into Afghan lakes and rivers, while that to the south and east eventually, by the Gomul and other rivers, joins the great river Indus.

Both these river systems differ widely in character one from the



LORA RIVER AT ITS JUNCTION WITH THE SHIRTO RIVER.

other, and both present very remarkable features seldom to be found elsewhere. If you look at the rivers flowing towards India, you will see that their general direction is at right angles to the lines of mountain ranges which separate them from India, and which they have had to cut through one by one before reaching the lower levels of the Indian plains. In cutting through these ranges these streams have formed deep, narrow gorges, which, in each successive range, become deeper and deeper as the level of the river-bed sinks lower and lower below the level of the crest of the range. Thus, when we come to the last range of mountains, which are commonly known as the Suleiman range, we find the drainage flowing through narrow gorges of almost

stupendous depth. It is hard to imagine anything finer than some of these gorges. Some of them, such as those in the Vihova and Kaha rivers, and especially those in the streams known as the Chuhar Khel, Zao and Gat Dhanas, are really marvellous gorges, wild and gloomy in the extreme. They are so narrow at the bottom that you can often touch both sides with your hands. Their walls of massive limestone rock rise perpendicularly upwards for several thousand feet. In places the sky is seen through a small slit, as it were, overhead; in other places, the walls overhang and so nearly meet overhead, that the sky is invisible from below. It is naturally impossible to give any real idea of one of these stupendous gorges in a photograph, but I will now show you a photograph of a very much smaller one, from which you can perhaps form your own impressions of the many other infinitely finer ones I have referred to. Notwithstanding the high mountain ranges which have stood in their way, these rivers reach the plains, and eventually find their way by the Indus to the ocean.

Now let us look at the other river system—I mean the rivers flowing into Afghanistan. You will see that they have not had the same difficulties to contend with in finding their way to lower levels, as they flow parallel, and not at right angles, to the mountain ranges. So far all has gone well with them, but not for long. All well-conducted rivers should reach the sea; none of these ever do. Those to the north get no further than the Ab-i-Stada lake, a wide sheet of water over 7000 feet above sea-level. Others meet a similar fate, but at a lower level, in the Lora Hamun; while the greater number join the Helmand, which, after a long journey, deserving a better ending, comes at last to a standstill in the lakes and swamps of Seistan. All these lakes are as salt as salt can be, and many of them, like the Ab-i-Stada and God-i-zirreh, are enclosed in wide margins of solid dry salt.

To revert to the highlands of Khorassan. We reached there in June, 1894, and thoroughly enjoyed the pleasing change of these cool breezy plains after the heat of the deep confined valleys we had been in. By the end of September, however, we began to find that the pleasant coolness of the summer had changed to severe cold. Our nomad friends the Kakars and Ghilzais had all departed east and west towards their warmer winter quarters, and none but the few resident Lowanas were left, and we ourselves were glad to leave. The winter cold in these parts is very severe, and the wide plains are swept by a cold wind, which, if the natives are to be believed, is death to the unwary traveller who may be caught by it away from shelter. The large heaps of whitened bones we found here and there near the marks of old Lowana encampments marked the places where whole flocks of sheep and goats had been frozen to death during the exceptionally severe snowfall of the preceding winter.

Descending from these highlands by various deep river valleys, and

passing from the country of the Ghilzais and Kakars into that of the Atobakzai and other Durani tribes, we got into the Kadabai valley. It was now late in December, the cold was very severe, and our thermometers registered as low as 8° below zero. It became a serious question whether we would be able to get over the high Toba mountains which lay between us and the Chaman plain before the heavy winter snow set in, and snowed us up for the winter. As it was, we ran it rather fine, for we only succeeded in getting our camp over the high Kanjan pass the evening before heavy snow set in and entirely closed the passes we had just used. The following night, although we were encamped in a deep, narrow sheltered valley, the cold was intense, and no less than eight of our baggage camels were frozen to death. This hastened our movements, and we lost no time in getting down into the plain north of Chaman.

We reached the little frontier cantonment of Chaman on Christmas Eve, 1894, where we saw the first new white faces we had seen for exactly nine months. Needless to say, our Christmas was made a very pleasant one by the kind hospitality of the Chaman garrison.

Those who visit Chaman generally think they have reached the end of the world, and can hardly realize the feelings with which we viewed that dreary little station. To us it seemed, after our wanderings in the wilds, a veritable metropolis of civilization.

The Afghan commissioner, Sardar Gul Mahommed Khan, was now succeeded by Sardar Mahommed Umar Khan, the chief of the great Nurzai Durani tribe.

Proceeding southwards from Chaman, we completed boundary demarcation by June, 1895, as far as Ghwazha. From Damandi to Ghwazha a boundary-line of some 360 miles had now been demarcated.

The summer heat put a stop to any attempt to do further boundary work in the deserts beyond. Work was suspended, and the mission temporarily dispersed. We met again in the following January, 1896. Many changes had taken place in the composition of the British mission, and our party now consisted of Captain H. F. Walters (24th Baluchcs) and Lieut. F. C. Webb Ware (7th Bombay Lancers), who were in command of the infantry and cavalry portions respectively of our escort. Surgeon-Captain F. F. Maynard came as our medical officer, zoologist, geologist, botanist, and meteorologist. Mr. G. P. Tate, a Fellow of this Society, took Captain Mackenzie's place as survey officer. With survey establishment's escort, tribal headmen, and followers, we numbered altogether some 650 men, with 750 camels and 100 horses. The Afghan commissioner and his camp were the same in numbers and composition as before.

By the end of February, notwithstanding a heavy snowfall on the mountains, we had finished boundary work along the Khwaja Amran and Sarlat ranges to the south of Shorawak, and entered near Nushki

the vast plain which fringes the Baluchistan desert. As far as this point from Domandi, the tribes concerned on both sides of our boundary-line had been Pathan and Afghan tribes. Beyond this point the tribes on both sides are Baluchies and Brahuïs. Before going further, I must say a few words about a very curious physical feature in this neighbourhood, which may be of interest to you. To explain it, I must refer to a severe earthquake shock which, on December 20, 1892, was felt over a large area of Baluchistan, during which the railway line between Quetta and Chaman, at a place near the Chaman end of the great Khojak tunnel, but fortunately outside that tunnel, was very curiously damaged. The rails were distorted, and, to put the matter briefly, the distance between Chaman and Quetta was lessened by no less than 24 feet. A fissure in the ground was found to run across the railway line at this place, and this fissure, running along a depression in the ground along the foot of the Khwaja Amran range, was then traced to a short distance on either side of the railway line.

It so happened that, when our boundary work made us more carefully examine this country, we found that a well-marked line of depression or indentation in the ground was traceable at the edge of the plain near Murghachaman, some 18 miles north of Chaman. Following this line, or, as I may call it, this earthquake crack, we found it to run some 18 miles in a well-defined line to the very place where the earthquake fissure had damaged the railway line in 1892. Thence it ran on, gradually ascending diagonally the slopes of the Khwaja Amran range until it actually cut the crest of the main range near its highest peak. Descending again into the Spintizha valley, it began again to ascend diagonally the slopes of a continuation of the Khwaja Amran range. Cutting this range in a similar manner, it descended to the Lora river, and, crossing that river, ran along the whole length of the foot of the Sarlat range to Nushki. Beyond this point we were unable to follow it. The total length of this wonderful earthquake crack, which we carefully surveyed, was no less than 120 miles. It is a well-defined broad line of deep indentation, in places as clearly defined as a deep railway cutting. Along the whole course of it are to be found springs of water, cropping up here and there. Both from the presence of water and from its forming a short cut across mountain spurs, this crack is largely used as a thoroughfare. We found that the old greybeards of the tribes residing in the neighbourhood all knew of its existence. They told us that during their lifetime, on some three occasions after severe earthquake shocks, deep fissures had appeared along this line, and that they had had similar accounts handed down to them by their fathers. After one of these occurrences, the water-supply of the springs along the crack had, they said, largely increased. I have roughly marked the position of this crack on the sketch-map. I may note that if the tunnel through the Khwaja Amran range had been bored, as first proposed,

at a point considerably south of the Khojak, this earthquake crack would have cut through it near the centre, thus enabling many valuable but possibly expensive observations to be made. This crack seems to mark the line of a gigantic geological fault. All the rocks on the east appear to be sedimentary, while those on the west appear to be igneous. In fact, as far as the Persian border on the west of it, we found nothing but igneous rocks. I am told the length of this fault-line exceeds that of any fault-line as yet discovered on this Earth. Whatever it may be, this earthquake crack or fault-line, whichever you prefer to call it, is a very



SAND DESERT NEAR AMIR SHOL

remarkable phenomenon, and deserves the serious notice of geologists and seismologists.

As I have mentioned before, we found ourselves at the end of February, 1896, near Nushki, with the vast Baluchistan desert before us. The prospect was not reassuring. It was difficult to obtain any reliable recent information about the country before us, and the only opinion we could get from natives who pretended to know something of the country, was that it was late in the year to attempt to cross the desert, and that there was even less water there than usual owing to the total absence of rain for upwards of a year and a half. The Afghan Boundary Commission which delimited the Russian Afghan boundary, had marched from Nushki in 1884 by the route shown in the small sketch-map to the Helmand river *sic* Kani and Galichah, and a portion of that mission had also returned by much the same route in

1885.* We had, therefore, information not altogether of a reassuring nature of that particular route; but on both the former occasions the journey had been done in the winter months, and it was possible, as we indeed sometimes found to be the case, that such information was not to be relied upon as applicable in the hot weather. Regarding the country west of the route taken by that mission, we had little or no information, as the greater portion of the actual country the boundary-line runs through had never before been traversed by Europeans. We had supplied ourselves with a large number of leather skins for carrying water, and took every other precaution we could think of for meeting the difficulties before us. We took with us, among other things, two Norton tube wells for boring for water. We had engaged a large number of the riding-camels of the country, and our intention was to provide a mount for all the footmen of our party. These camels, called "jambazes," are a breed of light camels, which, though not nearly so good as regular riding-camels, are under favourable circumstances able to carry two men or one man and a small load, and travel long distances in the day at a moderately fast pace. Owing to the continued drought having dried up all the grazing food and vegetation generally to be found in the country, these jambazes, we found, were for the most part not only unable to carry a single man at a fair pace, but had to be dragged along by their nose-ropes unloaded at a slow walk. To all intents and purposes they were practically useless, at any rate for the first two months of our journey. Later on, on nearing Persia, we found more vegetation for them, and they rallied sufficiently to give us some slight assistance on the way home. The mortality among them and our baggage camels in the desert was very great, and often gave us great cause of serious anxiety.

Our boundary work prevented our strictly following the route taken by the Afghan Boundary Commission of 1884, and we made our way across the desert to Robat as best we could to suit the exigencies of boundary work, marching from one set of known wells to another. As a rule we used to find, on arrival, the wells either filled up with sand or full of a filthy black odoriferous liquid, which had to be first emptied out. However, by digging wells close by existing ones, we used to find water at a moderate depth of from 6 to 10 feet. Chemical analysis often showed this water to be anything but desirable for drinking purposes; but we had to take what we could get, and be thankful. I may as well say here that we made many attempts to use our Norton tube wells, but never with success, as the tubes and pump invariably got choked with fine sand, which prevented them drawing up water.

Let me say a few words about the desert, from Nushki to Robat.

* Surgeon-Major O. T. Duke had also left on record some interesting and valuable information of the country between Nushki and Chaghal, collected many years ago when he was a political officer in Baluchistan.

Somehow one generally connects the word "desert" with a flat level country, but it is obviously wrong to suppose that a desert consists of only plains. From Nushki to Chagai we do find a vast level plain, and a plain, moreover, of alluvial soil. You will see that all the drainage from the mountainous country to the east of it, as far as Quetta and Peshin, flows out into this plain by the Lora and other rivers, and that these rivers find their terminus in the Lora Hamun. In flood-time this Hamun is a wide sheet of shallow water, but it soon evaporates, and for most part of the year is like it was when we saw it, a large sheet of dry salt. In old days this whole plain, including all the flat Shorawak plain, must have been a huge lake, to account for all this



HUNTING IN SANDHILLS

vast expanse of level alluvial soil. All along the north of it stretches the wide sand desert called Registan, a vast sea of billows and billows of sand upwards of 200 feet high, which is slowly but surely advancing year by year, and burying the flat alluvial plains south and east of them. This wilderness of sand stretches northwards as far as the Helmand.

You find on the level plains stunted shrubs of sorts, and all over the sandy portions abundance of a species of tamarisk known as the white tamarisk, and called by the natives taghaz. It grows to some size, but always looks a bleak, starving, neglected sort of tree. It assumes a weird and ghost-like appearance in the moonlight, and somehow always seems to impress a sad, mute protest at the howling sandy wilderness around it.

West of Chagai the character of the desert changes; instead of plains we have lofty ranges of desert mountains, upwards of 8000 feet high, and stretching westwards for some hundred miles. North again of these, as far as the Helmand, lie deserts of sandhills interspersed with flat plains of black gravel.

Briefly speaking, we marched along the southern fringe of the sandy Registan desert to the foot of the massive range of mountains west of Chagai. As one first approaches these mountains from the east, they stand out in a grand, high, rugged black mass with jagged peaks, several of which are over 7000 feet high. Crossing the level plains towards them, one cannot fail to be struck with the likeness the scene presents to a mountainous sea-coast as seen from a few miles out at sea on a clear calm day. The mirages which produce the reflection of the black cliffs beyond on long wide stretches of seemingly calm water at their base, with here and there a black rock standing out as an island in the watery expanse, render the similarity very life-like and effective. The lava and other volcanic rocks of which this mass of mountains is formed, lead to the conclusion that we have here the remains of ancient extinct volcanoes. These mountains are, for the most part, very inaccessible, and abound in ibex and oriol, or wild sheep.

Working through the Chagai range, we reached Robat on March 21. Our camels by now were getting very knocked up, not so much from heavy work as from want of food, and the mortality among them had given us cause for much anxiety. The abundant camel-grazing we had been led to expect by every authority who had previously reported on this country had proved a sad failure, as the land was suffering from a severe prolonged drought. All the vegetation was dried up, and even the taghaz, or white tamarisk, which grows all over the country, was dried up even more than usual, and useless as camel food. The warmth of spring had as yet failed to renovate the parched vegetation, but had succeeded in doing something else less useful and pleasant, *i.e.* in bringing out in vast numbers snakes, lizards, spiders, and scorpions of every kind. We used to secure large numbers of specimens daily. These and the ibex and the wild hill sheep appeared to be the only living inhabitants of the country. The few natives of these parts, whether from fear of strangers or from absence of food for their flocks, had fled and deserted the country. We had scoured the country round for miles to find natives, in order to procure sheep and goats from them for food, but without success. This was not reassuring, more especially as we knew that at Robat the real difficulties of the country were only beginning.

As I said before, the Afghan Boundary Commission had traversed the desert as far as Robat in 1884, and the adventurous traveller, Captain Christie, had used much the same route as that mission as far back as 1810. The only two Europeans, however, who had ever visited

the deserts west of Robat, were the late Sir Charles MacGregor and Captain Lockwood, who got as far as Godar-i-Shah in the cold weather of 1877, by the route shown in the hand-map issued to-night. The information they then obtained was the only source of reliable information we had to go upon, and it was a serious question whether we would find water in the places where they had found it to exist nineteen years before.

Beyond Robat the desert becomes practically almost a waterless one, and we found that it would be suicidal to attempt to take on our large camps with such feeble camels beyond that place. The British main camp remained at Robat, where there was a good supply of spring water; and the Afghan main camp withdrew to the Helmand river,



RUIN AT GODAR-I-SHAH.

while the Afghan commissioner and myself proceeded onwards along the boundary with a small party of picked men and animals. Our party consisted of Dr. Maynard, Mr. Tate, and myself, with a camp of some hundred and fifty men and two hundred camels. The Afghan party came to about half those numbers. We left Robat on March 26. From near Robat the boundary-line runs for nearly 200 miles in an absolutely waterless desert, without water on or near it. We therefore had to make wide *détours* to obtain water, and had to march, on occasions, from 50 to 70 miles from one watering-place to the next. This meant carrying a water-supply for two or three days for our whole camp with us. The camels, poor creatures, on these occasions had to do without. Even at the watering-places we often found the

supply, after much hard work in digging new wells, very scanty. It would sometimes take the whole day to water our camp, as the small wells soon were emptied, and took a long time to fill up again. At night the water-skins for carrying on with us used to be filled, and it sometimes took two or three nights to fill up all that were required for the next waterless stage.

Marching *en* Darband and Amir Chah, we kept to the north of the Koh-i-Sultan, Damodim, and other mountain ranges. At times our journey lay through wide open level plains covered with black gravel, at others we floundered our weary way through broad expanses of deep sandhills which, near Amir Chah and other places, assumed the proportions of formidable sand-mountains. All the mountains we passed were apparently volcanic; some, such as Damodim, retain their crater form more than others. Lava, pumice-stone, and lava ash abound plentifully everywhere. These volcanoes have evidently long been inactive, but some 90 miles to the south-west of them, and within the Persian border, is a still active volcano, the Koh-i-Taftan, 12,600 feet high, of which we occasionally caught glimpses on clear days. These mountains are all being gradually covered up and buried in the sand, which is relentlessly creeping further and further up their sides. Many are already completely buried, and a high mountain of sand marks their burial-place. Others have their black peaks just appearing out of the white expanse of sand-slopes. Here and there a loftier mass still towers with its black crags high above the devouring waste around, but the sand banked up on their sides in places sometimes 1000 or 2000 feet above the level of their base, foretells a similar fate in store for them. The general effect of the scene they present is weird and unnatural in the extreme.

We experienced great difficulty from want of guides. Those few we had were not all good. It is hard to realize the difficulty of finding one's way in a sandy desert even with experienced guides. Even in the vast open stretches of flat plain the same difficulty exists; mirages appear and lure one off the direction one should follow. It is not uncommon for a guide to sit down on the march and refuse to go a foot further, saying he sees nothing but water and trees all round, and that his head is spinning round. At another time a sand-storm may get up, and earth and sky become one moving mass of flying sand. It fares ill at such times with any one who struggle even a few yards from the line of march. Five minutes of a sand-storm would obliterate the deep tracks of an army corps. Some of our party had narrow escapes. On one occasion three of our men were lost in a sand-storm. Two were found in a critical condition after wandering about for two days without water, and the third was found after being three days without food. At another time one of our native surveyors, with a party of seven men, failed to find our camp, and started off in a wrong direction, and their guide deserted them. They fortunately hit upon water, and killed one

of their camels for food, but had to live on leaves and roots for five days before they found us again.

The heat had by this time become very severe. The thermometer used to record up to 116° Fahr. inside our tents, and our solar radiation thermometer used to register outside on cloudless days a sun-heat of 205° Fahr. by nine o'clock in the morning. It was not made to register higher than that, or we might have obtained still higher records. As it was, it used to register in places a temperature in the sun equal to that of boiling water at the same place. At any rate, we found it quite hot enough for ordinary comfort, and the heat, combined with a strong hot wind and sand-storm, often made rest during the daytime impossible.



MORAT, WITH THE MARTE BOKH AND MOUNT.

To those travellers who are tired of the cold of the arctic regions or the damp swamps of Africa, I can thoroughly recommend the genial dry warmth of summer in these deserts as a pleasing change. Owing to the heat, we always had, of course, to make our marches at night. We used to strike camp about sunset, and as a general rule march on by moonlight or starlight all night, arriving at our next halting-place before light in the early morning. At other times, should a sand-storm get up, or the night be an exceptionally dark one, we used to have to come to a stop and lie down wherever we happened to be, until either the moon rose or the day broke, and we could see sufficiently to pick our way. On those occasions we used sometimes to be overtaken by the light and heat of the following day, and then the want of water used to be cruelly felt. On one occasion I remember we got, on a dark night, into a labyrinth of deep ravines, and, after stumbling about

nearly all night with incompetent guides, found ourselves at daylight near a place we thought we had passed early the evening before. We did not reach water till the afternoon, and did not get to our intended halting-place till the second morning. Such are the delights of night-marching in unknown country. With a long straggling line of men and transport animals like ours, many precautions had, of course, to be taken to prevent those behind losing their way. Beacon fires used to be lit wherever fuel was available on the march, and a strong rear-guard formed to see that no men or animals were left behind on the road. No amount of severity sufficed to prevent men falling down asleep on the road. Fatigue and drowsiness obliterated all thought of punishment and all fear of the fate that this inhospitable country metes out to lost stragglers.

The thing which strikes one most in travelling in a desert, whether it be by day or night, is its awful stillness and solitude. Not a sound is to be heard, except now and then the rustling of the wind over the sand. Not a living creature, man or beast, is to be seen day after day. Here and there, after miles and miles of trackless sand, you come upon the footmarks of a herd of deer or a herd of wild asses, but you seldom see those animals themselves. Snakes and lizards, it is true, you see everywhere, and a more snaky country than this is in the hot weather, it is hard to imagine. There was one sound, however, that did sometimes break the dead stillness of a night march, and that in an unpleasant manner—that was the deep hiss of the horned viper. This pleasing reptile, of which we came across many, lies during the day with only its head showing above the sand, and it is almost impossible to distinguish it from the sand. At night, however, it used to sit up and hiss loudly whenever any one approached it. If we had a lantern handy, or could set fire to a bush to enable us to find the beast, we used to dismount and kill it; but at other times we all used to make a wide *détour*, and leave it hissing a proud defiance at us as we passed away in the distance.

Some of our party had very narrow escapes from venomous snakes, but fortunately we had no casualties from that cause. One night I saw a venomous snake, an *Echis carinata*, actually strike one of my men on the hand as he was pulling up a small bush to throw on a beacon fire. Luckily, the shot was a bad one, for the snake's head glanced off his hand sideways without the fangs piercing the man's skin. On another occasion, one early morning a very fine specimen of the same viper came out of a small hole in the ground over which I had just been sleeping. A few minutes before he might have caught me napping, but as it was he got up too late, and went to join our zoological collection. We generally looked for a clear spot to lie down and sleep on, but as often as not we were too sleepy and tired on our night marches to bother much about it. One night, as he threw himself

down to sleep on the sand not very far from me, Dr. Maynard made some remark about the ground sounding curiously hollow, and in fact kept me awake, as I thought, unnecessarily long propounding theories for this phenomenon. His theories, it turned out, were wrong, and he didn't solve the question until after he had gone to sleep. When I woke next morning he was gone. It appears he had gone to sleep on a huge anthill, and was almost eaten alive.

Striking from Amir Chah across the desert westwards, we reached the Saindak and Kucha range of mountains, which run in a long line



THE KURA-I-SULTAN.

north-west and south-east along the Persian border. Here we found abundant supplies of water, and here, too, we met a few natives of the country, and got some meat from them, which we were badly in want of. We had up to this seen only three natives of the country for a space of nine weeks. Boundary work, however, took us down into the desert again to Godar-i-Shah, at the western extremity of the God-i-zirreh. The God-i-zirreh is a large lake of clear, deep blue water, some 25 miles long and 5 miles wide, standing in the midst of a wide margin of solid salt. It used to be fed by flood-water from the

river Helmand, but, from the Helmand having dug out a deeper bed for itself, or from other causes, it now seldom receives any replenishment. The last time it received any water from the Helmand is, as far as I can ascertain, as long ago as 1880, i.e. seventeen years ago. All the drainage which, in the natural course of events, should flow into it from the mountain ranges south of it, is intercepted and swallowed up by the wide barriers of sand lying in the way, and thus never reaches it. Its water is now so salt that even waterfowl avoid it. Godar-i-Shah, Gumbaz-i-Shah, and Kila-i-Maksud, near the west extremity of this lake, are uninhabited places, marked by the site of old ruins close to each other, on the banks of the Shelag, a now almost dry river-bed, which used to bring the overflow water of the Seistan lakes into the God-i-zirreh. A few pools of salt brine are still to be found here and there in its bed.

This place was the farthest point reached by the late General Sir Charles MacGregor with Captain Lockwood in 1877, after a long adventurous journey through the desert. Poor Captain Lockwood died from the effects of the hardships of that journey a few days after his return to India. Sir Charles MacGregor gives a very graphic account of the country, and the delights of travelling in it, in his '*Wanderings in Baluchistan*.' And I would especially refer you to his description of Godar-i-Shah in that book. He does not appear to have been favourably impressed with the place. Talking of the water, he says, "And such water it was. Ugh! the remembrance of it will stick to me till I die. There are certain things I never forget: one is a particular powder an aunt used to give me at Portobello when a child, and I am sure another will be this water."

"If any should wish to save themselves the trouble of going to Godar-i-Shah to fetch it, I think I could give a receipt which would taste something like it. Take, then, the first nasty-looking water you can find. Mix salt with it till you make it taste as nasty as it looks; then impregnate it with gas from a London street lamp, and add a little bilge water; shake vigorously, and it is ready for use. (N.B.—The test of its being sufficiently nauseous is, that after drinking you cannot even speak for a minute or two.)"

Well, that is Sir Charles MacGregor's opinion of the Godar-i-Shah water.

We spent upwards of a week in this pleasing place, and had ample experience of this water, which fully bore out that opinion, but I am bound to say it was not nearly so bad as much we found elsewhere.

It is hard to realize nowadays, on seeing this desert waste at Godar-i-Shah, that it marks the site of extensive and flourishing civilization in ancient times. All who have ever travelled along the Helmand river have recorded their astonishment at the almost endless stretches of old ruins along the banks of that river. These ruins extend all over

Seistan, and here right away down at the very south of Seistan, at Godar-i-Shah, we still find them. They mark the remains of old flourishing towns and cities of past times, and, together with the numerous traces of old canals leading from the Helmand river, prove the existence in some past age of extensive civilization and of a very large population. Who built those cities, and who cultivated this once rich country, one cannot now say. The past history of the country is buried in obscurity. Several have offered opinions on the subject, but only to be contradicted by others. We know that Alexander the Great marched through this country, and found there cities and a civilized people. Zirreh is said to be the modern form of the old name Zarenj, which was the capital of the Zarangae or Darangae tribe mentioned by Arrian. Persian tradition has, again, made Seistan famous as the home of the great Persian hero Rustam. We also know that the Kayani kings ruled in Seistan and the Helmand valley until their final overthrow and extirpation by the Persian Nadir Shah at the beginning of the eighteenth century. Whether the old ruins now existing mark the towns mentioned by the writers of Alexander's times, whether they are connected with the age of Rustam, or as recent only as the latter days of the Kayani kingdom, it is now hard to say. We must leave it to archaeologists to decide. They will find this country well worth studying, and it is to be hoped that at some future date careful archeological investigation, which has been impossible up to now, will throw light on the history of what must have been a numerous and civilized people.

Since Sir Charles MacGregor's visit, Godar-i-Shah has been visited by Captain Hon. H. D. Napier and Mr. Merk, *c.s.t.*, but both came there from the Persian side.

We were not sorry to leave Godar-i-Shah, as the heat there was very severe. Proceeding westwards, we reached the foot of the Koh-i-Malik Siah range, and on April 16—a red-letter day in our mission records—we erected our last boundary pillar on the top of Koh-i-Malik Siah, a peak 5500 feet above sea-level, to mark the end of our long boundary-line between Afghanistan and Baluchistan. From this point northwards runs the boundary settled between Persia and Afghanistan by Sir Frederick Goldsmid; and from this same point southwards runs the boundary-line between Persia and Baluchistan, just laid down by Colonel Holdich. The massive stone cairn, some 20 feet high, which we built at the top of this mountain, now marks the point "where three empires meet," for here, at one point, British, Persian, and Afghan territories join. As soon as our camp, both men and animals, had had a few days' rest, and had recruited their strength with the good water we found there and with the food supplies we had obtained from Persian Seistan, we started homewards. The Afghans had had enough of the desert, and preferred to strike across Afghan Seistan to the Helmand, and thence along that river, while we returned to Robat across the desert by much

the same route we had come. We agreed to meet each other once more to draw up final deeds, etc., at Robat on May 5.

On the return journey we took the opportunity of exploring the Koh-i-Sultan range, which we had passed on the south of our route on coming. On passing as we did to the north of this range, we were greatly struck by the queer, grotesque shapes of its numerous sharp peaks. And more especially by the appearance of what, as we saw it from a distance, looked like a huge masonry pillar erected on the crest line of the range. This pillar is known as the Neza-i-Sultan, i.e. the spear of Sultan. Sir Charles MacGregor saw these mountains from a distance in 1877, and he speaks of them as the oddest-looking mountains he had ever seen. He was greatly struck with the appearance of the Neza-i-Sultan, but neither he nor any other European had ever yet been close up to it. On entering the range our trouble was well rewarded, for a more extraordinary mass of mountains it is almost impossible to conceive. As we rode along in the bright moonlight, we saw high pointed pinnacles and minarets all round us, and here and there steep masses of conglomerate, which formed the peaks, looked exactly like old Gothic cathedrals and churches. Nor did this resemblance fade away in the daylight. The Neza-i-Sultan we found a truly marvellous feature. It is a perpendicular column of hard conglomerate, with straight precipitous sides. The fissures made by rain and weather action down its sides give it a fluted appearance from a distance. We expected to find a high natural pillar, but were not prepared for the stupendous size of the reality. Judging from its width at the base, which is over 100 yards in diameter, the height must be no less than from 500 to 600 feet. You can, therefore, realize the effect of this gigantic column when seen from below. The name Neza-i-Sultan means the spear of Sultan. This Sultan, who also has given his name to the whole range, is an ancient mythical celebrity who is said to have been buried in the vicinity. His full name is Sultan-i-Pir-Khaisar, and he is the patron saint of Baluch robbers. This may account for the Koh-i-Sultan having a very bad reputation as a robber resort. These mountains abound in the assafoetida plant, and in the summer months traders come in numbers from Afghanistan to collect it.

Well, I must hurry on. We reached our main camp at Robat on May 1, and were glad to find them all well and flourishing. We had been nearly six weeks away from them, and, as we had not been able to keep up communication with each other during that time, we found a most welcome supply of letters and news awaiting us. On May 5 the Afghan Commission arrived, and by May 14 our final agreements and maps were prepared and signed, and we were able at last to start homewards. The Afghans returned to the Helmand *en route* for Kandahar, while we followed, as far as Nushki, much the same route as that by which we had come. It was a trying journey, as the heat was very

severe, registering 116° Fahr. in our tents. We marched as before, always at night, and now were able to get little or no rest by day, for the "Bad-i-sad-o-bistrez," i.e. the wind of 120 days, had now sprung up, and blew with hurricane violence day after day the whole day long, blowing down our tents, and smothering us in sand. This charming wind gets up every year about May, and blows without ceasing from the north-west for four months. While it lasts, it makes life along the Helmand valley and the deserts on either side a perfect purgatory. Right glad were we to at last reach the edge of the desert at Nushki, and ascend out of the hot wind-swept plain into the cool, refreshing air of the high mountains west of Quetta. We reached Quetta safely on May 29, 1896, and there our troubles ceased.

Boundary delimitation and demarcation work was the sole object and aim of the mission whose wanderings I have now described, but in the course of it our energetic survey officers, i.e. Captain R. J. Mackenzie, R.E., during the first year, and G. P. Tate, Esq., during the second year of the mission, and their staff, besides carrying out the actual survey work required for boundary delimitation purposes, took excellent advantage of the opportunities afforded of making a careful survey of the whole country through which we passed, on a scale of 2 miles and 4 miles to the inch. I have not the actual figures to refer to, but I believe considerably over 30,000 square miles of country were thus carefully surveyed, much of which was, to all intents and purposes, new country. Much valuable ethnological information was collected, and our scientific work included careful meteorological records, and also large zoological, geological, and botanical collections. Our zoological collection, thanks to the energy of Surgeon-Captain Maynard, is a very large one, including several thousand specimens. As might be expected, from the countless reptiles the desert abounds in, our zoological collection was largely of reptiles. Among them are many rare species and many quite new to science. Our old friend, the horned viper,* turned out to be not only a new species, but a new genus. The zoological and other collections are now being carefully worked out by the officers of the Calcutta and British museums. Besides a few taken by myself, the photographs with which this paper has been illustrated were taken by the following gentlemen, to whom I am much indebted for the loan of them, i.e. Lieut. R. A. E. Benn, 5th Bombay Cavalry, for those of the country between Domandi and Chaman, and G. P. Tate, Esq., for those of the country between Chaman and Persia.†

* This snake has been named the *Eristicophis Macmahonii*.

† May I be permitted to mention my Dachsund Donnie, who figured in several of the photographs with which the paper was illustrated. He not only accompanied his owner throughout the wanderings of the Baluch-Afghan Boundary Commission, but also accompanied him in 1893 to Cabul with the Darsul mission. He has traversed most of Baluchistan, and almost every portion of India.

THE PERSO-BALUCH BOUNDARY.*

By Colonel T. H. HOLDICH, R.E., C.B.

South-west and south of the district with which Captain McMahon has been dealing, lies a somewhat remarkable country which has long been a riddle to geographers and ethnographers alike, the mysteries of which have lately been unravelled in connection with boundary demarcation. Captain McMahon has described the watershed which traverses the desert south of the Helmand, shutting off that great river system from the Mashkel lake, or Hamun, district further south. This great basin of Mashkel covers a very large area of varied country, and includes the drainage from those mountains to the west which now form the Persian frontier, as well as that of other mountains to the south, which form the northern outposts of Makrân. About the edge of the Hamun (which is a salt swamp in dry weather and a shoreless sea in times of flood), on the western side of it, are a few scattered date groves, inadequately cultivated, ragged, and unproductive, which from time immemorial have been a bone of contention between the wild and lawless Damani tribes of Eastern Persia and the desert-bred Bekis of Baluchistan. Raids and reprisals, blood feuds, and wayside murders have been hatched and bred in those wretched date-groves, until matters had reached an acute fighting stage, when our Government stepped in and decided to have a Persian boundary as well as an Afghan boundary. Besides the date groves there were other political matters of dispute which had stood over since the historic days of the Seistan Boundary Commission, a quarter of a century ago, and which had proved at the time to be nuts too hard for that Commission to crack. Thus it fell out that whilst Captain McMahon was busy with a section of the Afghan boundary south of the Helmand, I was acting as her Majesty's Commissioner within a few days' ride of him on another and totally distinct Commission, the basis of which was a treaty between the late Shah and our English Foreign Office.

In connection with this treaty there were about 300 miles of boundary to be defined, extending from the Malik Siah Koh in a south-easterly direction to Kohuk, on the Mashkel river, and there were but two or three months in which to define them. The season was well advanced before political negotiations were closed, and it was, in fact, on this very day, February 22, exactly a year ago, that the British and Persian Commissions met on the banks of the Mashkel river, after having travelled, the one from Karachi by sea to Gwadar, and thence across the backbone of Makrân to the Mashkel; and the other from far-off Teheran in the north-west of Persia, in the space of about one month.

* Read at the Royal Geographical Society, February 22, 1897.

Now you must not allow the desolate blankness of the map of those regions to mislead you. For many years, whilst acting as superintendent of the Baluchistan Surveys, my attention had been directed to this corner of Asia; and chiefly by the agency of well-trained native assistants, not only all Makran and the borderland in dispute, but very much of Eastern Persia too, had been well reconnoitred and fairly surveyed. I should emphasize the word surveyed. I do not mean that individuals had merely passed along a line of country, contenting themselves with leaving a red trail over a blank white space as the map-record of their travels, but that sound square mapping, with no detail of importance omitted within its limits, was rendered up at the end of the season's work. Thus it happened that we possessed excellent geographical mapping based on triangulation of the whole of this region, and that it was with completed maps in our hands that we entered on boundary negotiations. In my Persian colleague I found a gentleman whose previous connection with the Seistan Commission had given him a most reasonable and delightful confidence in the accuracy of British surveyors. Thus we were able to get the 300 miles of boundary settled and demarcated without any waiting on preliminary survey processes, and by the beginning of May, ere the hot-weather blasts had made that sun-stricken land unbearable, and before the death of the late Shah, we were back again in India with our work complete.

Of the incidents and the strange experiences of that remote commission there is no time now to speak at length; I can only say that the race hatred which exists between the desert-born Baluch and the Persian "gujjer" (as they call him) was strong enough to give us a bad quarter of an hour occasionally, and one could not but feel that the rapid conclusion of negotiations was a merciful dispensation of Providence. One can only look back to the history of the weary Seistan boundary struggle twenty-five years ago, or to the well-remembered experience of the yet more protracted boundary proceedings that were rendered famous at Panjdeh, and note with satisfaction the changes that time has wrought in demarcation procedure—and wrought chiefly by the aid of a better official appreciation of the advantage of correct geographical knowledge.

You will at least understand that my survey assistant, Colonel Wahab (who only very lately had been associated with me in a successful struggle to carry the triangulation of India across the Himalayas into the Pamirs, and thus effected the first scientific junction between Russia and India), found no such scientific achievement ready to his hand in this remote Baluch wilderness. We gathered in little new geography; yet, as the geography of this region is a comparative blank in our maps and must be new to many of you, I will say a few words about it. I must pass over the strange conformation of these western hills, along the watershed of which the Persian boundary now runs, and from which a

complicated drainage falls into the Mashkel swamps; and I must leave the interest that attaches itself to the gigantic snow-capped volcanic mountain system which flanks these mountains to another day. It may be that Captain Sykes (who, with Captain Kemball, was one of my political assistants) will some day tell you of his first ascent of that extraordinary peak, 13,000 feet high. So remarkable a volcano in so remote a region is a geographical feature strange enough to require a chapter to itself; and you are taking your geography to-night too much compressed for casual descriptions. I will only draw your attention to the general geographical character of those districts which by this recent demarcation now fall within the sphere of British Indian influence, and to their relation both to East and West.

You will see that, flanked as it is by great stretches of desert to the north, and by the sea to the south, this remote Makrân region, in which lately so much of general scientific interest has arisen, forms a natural geographical gateway between Persia and India. This is, indeed, precisely the *role* which Makrân has filled in past historic ages; and if it filled that position now, there would be yet this interest to add to all others, that the country would possess great military significance. The key of this gateway has, however, always been held by the predominant power in the Eastern seas; and ever since three small British ships issued out of Paani harbour, and defeated the last Portuguese squadron that sailed the Arabian sea, that key has been held by us. Before that period (so long before that history does not hold the record) we know now that Dravidian races, driven out of Mesopotamia by Semitic invaders, swarmed through this country to India, leaving behind them curious records in stone of their occupation of the country, and a considerable remnant of their people besides. Then we hear of Alexander's reckless march through this same land three hundred years a.c., when he attempted to force his way by an impossible shore route to Persia, and lost two-thirds of his army in the vain endeavour to support his fleet with his land forces. The description of that retreat, as told by the historian Arrian, is so complete and so graphic, that not only is it comparatively easy to trace out the route followed by Alexander, but from it you may gather a very fair idea of the nature of the country as it exists to-day.

About a thousand years later the Arabs swept through from Syria, and not only conquered all the Indus valley, but set to work to establish a system of roads and irrigation which maintained enormous cities, and turned this Makrân wilderness into a world-famed commercial centre. With Arab reminiscences—the remains of these cities and the remnants of gigantic irrigation schemes—the whole country teems; but the Arabs themselves are only now represented by a powerful confederation of tribes who, indeed, represent the typical Baluch of to-day, but who have hardly a word of Arabic in their language. Then came the great

discovery of a sea route to India and the turn of the Portuguese, and with it the extinction of Makrán as a highway to India, and its lapse into a phase of darkness so profound that twenty years ago about as much was known of it as we know of the darkest forests of Africa. Now again the light has broken on those rugged hills and palm-covered valleys, and most of its dark places have been made plain.

The narrow fringe of sandy unprofitable shore which sets a northern limit to the Arabian sea, is broken here and there by gigantic headlands stretching seawards, and is backed by mountains for its entire length until you approach the Dasht river, where the mountain system becomes broken and recedes northwards. Here is the point where routes into Persia strike inland. Here and there we find harbours formed by the outlying headlands, which give protection to the fishing craft of the coast, and support small townlets which are usually stations of the Persian Gulf telegraph service, and do a considerable trade in dried and salted fish. Of the townlets Gwadar (which is an Arab possession, owning the Sultan of Muskat as sovereign) is the principal; and from Gwadar salt fish is exported to the west coast of India and sharks' fins to China. How such a trade can pay I do not pretend to say.

The fish industry which pervades the coast pervades the atmosphere also. All the Makrán coast stinks of fish, and all the Makráni people live on fish. Dogs, cats, cattle, and even camels, eat fish. The old lechthyophagæi of the Greeks are offensively predominant throughout the coast districts; and, strange to say, after all these centuries, the old mystery of enchantment hangs over that coast still. I have been taken to the enchanted island of Astola, where, even now, there dwells a lovely, but most pernicious, mermaid, who turns men into fish, and where, no doubt, most excellent use has been made of the mysterious envelopment of the island by the pirate Meds, who used to bring the crews of captured vessels here and murder them wholesale.

The roads from the coast inland are few and far between. They are not good roads when you find them, for as they trend northward they cross the axis of all chief ranges and ridges of the country. The hill conformation is very peculiar, though closely allied to that which exists on the frontier from the north-west of India (*i.e.* south of Waziristan) to the Arabian sea, and which continues again from Makrán to Western Persia. Close-packed, narrow, knife-edged ridges run parallel to each other and to the coast, sometimes swelling into well-defined mountain systems, sometimes dwindling into a mere display of sharp points, emanating like sharks' fins from the billowy plain, but always offering the sharpest, stoniest, and most aggressive obstruction to the traveller bound northward. It follows that between these ridges running east and west, or following the trend of the coast as the coast itself shapes a new course, there are long narrow valleys offering means of communication as good as that which crosses them is bad.

It is in these valleys that the wealth of Makrân lies, and it is wealth not to be despised even in these days. Thick groves of date palms occasionally fill up the landscape like a sea, with the white towers of village forts rising above them, as islands break the surface of an inlet : rank luxuriance of cultivation lies under the palms, where wheat-fields enclose fruit orchards, and fair-sized streams are diverted into a network of irrigation channels. There are districts in Makrân where the fierce heat of early spring forbids the existence of any form of life whatsoever, and there are also sweet, well-shaded valleys, the beauty of which is hardly surpassed even in Kashmir. In amongst them all lie the remains of an ancient civilization, such as may be seen in the ruins of old cities, of old forts, of roads, and of canals. These tell a tale which we may hope are long fairly to unravel.

Old as this Asiatic world may be, it is yet a new world to much of scientific inquiry. Its geography is fairly solved, but its ethnography is still a riddle, and its history, when research and investigation shall unfold it, will fill up many a gap in the stories of the nations, if it can never claim a national character itself. I deeply regret that I have neither photographs nor sketches to illustrate some of the more remarkable corners of this No man's land. It is not that I have neglected to secure such records, but that they are in India, whilst I am here. I can only hope that in calling your attention to this long-forgotten country I have claimed your interest in succeeding records when perchance there may be leisure and opportunity to tell a completer tale.

Before the reading of the paper, the Chairman, Admiral WHARTON, said : I am sorry that Mr. Curzon, who was to have presided here to-night, has been prevented by his public duties. We can understand that at present he has not much time to spare. I am particularly sorry, because I feel a sailor is out of place in the chair when talking about the borders of Afghanistan, of which I know nothing and Mr. Curzon a great deal. I do not think I need do more than introduce to you the lecturer, Captain McMahon, who will now read his paper.

After Captain McMahon's paper, Admiral WHARTON said : While Captain McMahon was tracing his boundary, Colonel Holdich was tracing another boundary, and he has kindly consented to give us a short account of his experiences.

After the reading of the papers, the following discussion took place :—

Admiral WHARTON : I am sorry Sir Frederic Goldsmid is not here ; I had a letter this morning from him to say he is unfortunately laid up. He conducted the former delimitation commission between Afghanistan and Persia, and brought it up to the point where Colonel Holdich and Captain McMahon took their surveys. Also Colonel Woodthorpe wished to be here, but I am sorry he has not been able to come. Would Mr. Alcock say something of the collections Captain McMahon brought back ?

Mr. ALCOCK : There is very little of general interest I can say about the collections brought back by Captain McMahon and Dr. Maynard. As Captain McMahon has said, his chief interest is reptiles ; in fact, judging from that collection, one is quite prepared to understand that Baluchistan is a land of reptiles. Another feature of the collection is the large number of scorpions, spiders, and venomous

spider-like creatures. I worked it out and examined the reptiles carefully: there are a good many species, including the viper Captain McMahon spoke of. It is a most interesting form, and we have christened it *Kristicaphis*,^a on account of its pugnacity: though all vipers are excessively pugnacious. I have not been able to examine the collection of scorpions and spiders and venomous spider-like creatures, which is large and interesting, but I have arranged with Mr. Pocock, of the British Museum, to examine and report on them.

Mr. BRAXFORD: Captain McMahon has traversed a tract of Baluchistan quite different from that I crossed with Sir Oliver St. John in 1872. It is exceedingly interesting to hear, both from him and from Colonel Holdich, that the country, previously unknown, has at length been opened up. I can entirely confirm Captain McMahon's account of the abundance of reptile life, as that is exactly what I found in going through the same country.

Sir HENRY BRACKENBURY: I am afraid I can add nothing useful to the geographical aspects of the question which has been brought before you to-night, and certainly nothing as to the geological aspect, and my knowledge of Baluchistan is but very small, for, though I visited Domanli with Captain McMahon when first he saw it, in the winter of 1891, and galloped over the plain of Zarmelan, and visited Okaman with him, I know little of the country in its rougher aspect. But there is one point I should like to say a word on, and that is what may be called the personal aspect of this work, the work as done by the man. I was a member of the Government of India which ordered these boundary expeditions, these delimitation expeditions, and we knew that there was a difficult task before those who had to conduct them. I think Captain McMahon's modesty—one of his characteristics—made very light of these difficulties; he has told us something and left us to gather something of the nature of that country, how most of it is an arid desert. Do you know how the people themselves describe it? They say that the Almighty, when making the world, used all the water, and grass, and flowers, and trees to make other beautiful countries, and when He had used all these, and had nothing left but a heap of rubbish, He threw that down and made Baluchistan; and I have heard others comment upon that and say, "We cannot understand, when He had made Baluchistan, that He took the trouble to make any other hell." That is the country in which Captain McMahon conducted that boundary expedition, a country infinitely desolate, infinitely arid, infinitely drear, and he had not only the difficulties of intense heat and want of water to contend with, but he also had to contend with that human difficulty which few know now so well as he does—the difficulty of dealing with the Afghan. I think it is only those who have dealt with the Afghan that can really know how obstructive a human being can be. Captain McMahon has shown a very charming photograph of his Afghan colleague, and spoke of his winning smile, and told us they didn't often smile both on the same day. From what I know of Captain McMahon, there was a subdued smile on Captain McMahon's face even when an open smile was on the face of his colleague, a smile which occasionally changed to the wrong side of his colleague's face. For these difficulties which Captain McMahon had to contend with were enormous; it is in the nature of Orientals, especially Afghans, to create difficulty in every matter connected with diplomacy. Here a boundary had to be defined. It was apparently a simple thing, because it had been traced upon the map and agreed to by Sir Mortimer Durand and by the Amir at the time of the mission to Kabul, of which Captain McMahon was a member; but it is one thing to trace a boundary on a map, and another thing on the ground. And there were special difficulties connected with such a question, such as watercourses

^a *Apertialis* = lover of fighting.

and irrigation, to whom the rights belonged; these give rise, when both parties are not anxious for a speedy issue, to endless delays and difficulties. Captain McMahon had to contend, first of all, with great physical difficulties; secondly, with these human difficulties, and by neither one nor the other was he ever discouraged; he had that characteristic which is absolutely necessary in dealing with these Eastern peoples, not only perfect courage, but absolutely infinite patience, and it was by these two combined qualities, courage and patience, that these boundary commissions were brought to their thoroughly successful ends. Sir, I think it is a matter of great pride to us as Englishmen, it must be a matter of great pride and constant self-congratulation, that there are always to be found men, young men, possessing these great and these grand qualities—men who, like Captain McMahon and Colonel Holdich, will continue to do for this empire the class of work they have done, and will continue to keep this great empire what it is.

Admiral WHARTON: The very eloquent and moving words you have just heard from Sir Henry Brackenbury leave me very little to say. I think, reading between the lines of Captain McMahon's story, we can see there were all these difficulties which Sir Henry has mentioned, of which Captain McMahon said nothing, and the stories we have heard to-night give us an idea of the sort of work that goes on throughout our empire from year to year in a quiet way, in the course of business that no song is made about, that make us proud we are Englishmen. I am sure we shall be only speaking your sentiments in offering our hearty thanks to Captain McMahon and Colonel Holdich for their extremely interesting papers.

CAPTAIN McMAHON'S MAP.—This sketch-map was compiled from the Survey of India map of Afghanistan of 1889; from the map published in the *Geographical Journal*, 1896, illustrating Colonel T. H. Holdich's paper on "Ancient and Mediæval Makran;" together with slight additions and alterations made by Colonel T. H. Holdich and Captain A. H. McMahon. The coast-line has been taken from the Admiralty charts.

THE RIVER ODER.*

AMONGST the many geographical advantages enjoyed by these islands, one of the least considered is our comparative immunity from great floods. The historical works of Lauder and others, and the later chronicles of the daily newspapers, do indeed contain accounts of destruction done by total inundations, but at the worst the total damage is rarely considerable, and there are few inhabitants of the United Kingdom who regard any of its rivers as a source of real and imminent danger to themselves or their property. Under these circumstances, as might have been expected, we know little about the hydrography of this country in detail, and the production of a work like that before us is impossible.

The Imperial Decree of February 28, 1892, placed two questions before the German Commission charged with the investigation of the

* Der Oderstrom, sein Stromgebiet und seine wichtigsten Nebenflüsse; herausgegeben vom Bureau des Ausschusses zur Untersuchung der Wasserverhältnisse in den der Ueberschwemmungsgefahr besonders ausgesetzten Flussgebieten. Berlin: Dietrich Reimer.

hydrographic conditions existing in regions liable to inundation: (A) What are the causes of the floods of recent years; is the system of regulation and canalization of the Prussian rivers responsible for the increased danger arising from floods in those regions, and, if so, what changes are to be recommended? (B) What further steps can be taken to diminish the risk to life and property in the future? With a view to answering these questions, the Commission set itself to collect and arrange all the existing observations concerning the physical and economical conditions of the different river-systems, and to fill up the numerous deficiencies by new observations, so as to complete a general survey of the hydrography of each system, and of the river interests and rights which might be affected by any proposed scheme of regulation. This vast undertaking was, in the first place, restricted to the basins of the Oder, the Elbe, and the Vistula, and the work now published forms the report on the first-named. It consists of three substantial volumes of text, a quarto volume of tables and statistics, and an atlas of thirty-six plates. The first volume treats of the general form of the Oder basin, its position, climatic relations, geology, etc.; the second describes in detail the separate secondary basins; and the third is devoted to a careful discussion of the actual streams of the main river and its chief tributaries.

The most important point to be borne in mind, in arriving at a clear understanding of the geographical relations of the rivers of Northern Germany, is the fact that the mountains and high ground forming the water-partings approach nearest to the sea-coast towards the west, while as we go eastwards they recede inland till the triangular North German plain merges almost insensibly into the great Russian depression. The southern border of the Oder basin touches on one side the division of the Carpathians known as the Western Beskids, and on the other the Sudetic mountains, whose north-eastern slope drains to the Oder throughout its whole length. Only the western part of the highland of Poland drains into the Oder—the plateau of Poland and Upper Silesia. But the peculiar distribution of the higher ground makes itself felt far into the plain, for the Bober and the Lansitzer Neisse join the main stream not far above the point where its volume is doubled by the Warthe and Netze, and it is to the latter that the immense area of low-lying plain in the Oder basin chiefly owes its existence; they traverse the belt of depression which extends over into the Vistula basin as far as the Rokitno marabes, and forms the true connecting link between the great Russian plain, with its extreme continental climate, and the diversified surface of Western Europe, where a broken coast-line carries the milder influences of the sea far inland. Hence the Oder occupies, as it were, an intermediate position, the lower parts of its course being subject to conditions similar to those characteristic of Western Europe, though to a modified degree, while the upper basin is in a continental

region, the continental characteristics being, however, again modified as compared with such rivers as the Vistula. These circumstances of position, together with the greater elevation of the southern part, give to the Oder basin a climate almost uniform throughout its length.

A remarkable feature of the Oder basin is the absence of the expansion and contraction observed in many rivers. The shape is in effect a somewhat distorted rectangle, the north-western side standing perpendicular to the south-western base-line, and the south-western side forming an acute angle with it. The length of the base is approximately 304 miles, and of the opposite side 245 miles, giving a mean length of 274 miles; the perpendicular distance between these sides is 166 miles. The "centre of gravity" of this figure lies east of Lissa, almost on the watershed between the Bartsch and Obra, and on the line dividing the German and Polish languages. The lowest point of the main watershed is at the Mährische-Pforte, between Böltzen and Weisskirchen, where the Oder is separated from the Danube, and the Atlantic from the Mediterranean, by a pass only 1000 feet above sea-level. From the Mährische-Pforte the watershed extends westwards for 682 miles, eastwards for 920 miles; 354 miles in the former case, and 103 miles in the latter, traversing mountains. The eastern part runs through the plateau of Poland and Upper Silesia for 217 miles, and the remaining 328 miles on the left of the main stream, and 600 miles on the right cross the low plains—amounting to 928 miles, 38 per cent. of the whole.

The great extension of the plains of North Germany and Poland towards the east gives the eastern sides of the river-systems an almost independent character: a general south-to-north direction is combined with an east-to-west stream draining the southern side of the rising ground near the coast, and the joint flow carries the waters of the whole eastern and north-eastern plain in each basin towards some point on the lower course of the main stream. Thus the Warthe and Netze in the Oder basin correspond to the Bug and Narew in the Vistula, the Havel and Spree in the Elbe, and the Aller and Leine in the Weser. The eastern tributaries are, therefore, for the most part rivers of the plain, in contrast to those received higher up on the opposite side, which are more frequently rapid mountain streams.

The point of junction with the Warthe accordingly forms, in the case of the Oder, an obvious division between the lower and upper courses of the river. A further division of the upper river is, however, desirable; and between the Warthe and Breslau may be called the middle Oder, the term upper Oder being kept for the part between Breslau and the source. This arrangement has many advantages from the point of view of commerce and navigation, but the formation of the river-valley gives a more scientific division at a point somewhat below Breslau, near the confluence of the Lobe, Weistritz, and Weide with the

main stream, where it is first deflected from its normal west-north-west direction by a ridge running east and west. The "middle Oder" is itself divided into upper and lower courses at its junction with the Obrzycka, where it enters the great Warsaw-Berlin valley. The upper Oder proper begins at its junction with the Olsa, where the four streams forming the original feeders unite and enter the Silesian plateau. This is also divided into upper and lower courses at the entrance of the Neisse.

Politically, 72 per cent. of the Oder basin lies in Germany, only 0.5 per cent. outside Prussia. The sources of the main stream lie in Austria, and of the Warthe in Russia, giving 6 per cent. of the whole basin to the former country, and 15 per cent. to the latter.

These facts, as stated in the introduction to this report, indicate the nature and extent of the area to be surveyed, and suggest the lines followed in the inquiry itself. Space does not admit of our even naming the thirty-five separate river-basins, each minutely described in the second volume under the five headings, configuration, soil, water-system, cultivation, and forest; still less can we follow the third volume through the detailed accounts of the Oder itself and its main tributaries. This volume is divided into three, the first section describing the bed and the valley of each part of the Oder corresponding to the natural divisions described above, the movements of water and ice in each, and the "Wasserwirtschaft," or artificial element introduced by dams, bridges, and the like. Section II. of this volume deals in a similar manner with the most important tributaries, excepting the Warthe, which, for geographical reasons already mentioned, has a whole division, section III., to itself. Every part of the work has been executed with the most laborious minuteness, and the facts discussed are constantly supported by the statistical tables, and illustrated by the innumerable maps, plans, and sections.

The general geographical interest of the report, apart from its value as a work of reference, centres round the papers on the climate and geology of the Oder basin, in the first volume. The first of these, by Prof. Dr. Kremser, discusses the interesting transitional climate of the region from the data of air-temperature and rainfall, with a sort of appendix on the other less widely observed elements. The variation of temperature with height is rightly regarded as an important factor in the temperature investigations, and special care has been taken in the comparison of the differences of temperature at such pairs of stations as Eichberg and Schneekoppe (1145 and 5260 feet above sea-level), and Eichberg and Wang (2864 feet), under varying conditions of clear and cloudy weather, and the abnormal conditions of the Föhn wind. The mean correction for height for the year comes out about 1° Fahr. in 330 feet, somewhat less than might have been expected, but easily accounted for by the frequent reversal of the temperature gradient in the colder seasons.

Where a river is concerned, the occurrence and duration of frost is naturally of special importance, and the comparison of Breslau and Stettin gives interesting results. On a mean of forty winters, frosts of less than ten days' duration occur with almost equal frequency, but for longer periods Breslau is higher, continuous frosts of over a month occurring there twice as often as at Stettin. Nevertheless, the longest frost on record (December 17, 1870, to February 16, 1871) lasted exactly the same time at both places. The lustral averages of nine stations for the forty years 1851-90 show temperatures below the general mean from 1851-55 to 1861-65, above it from 1866-70 to 1881-85, and again below it from 1886-90.

The geological work was placed in the hands of Dr. Datho, who is responsible for the hill and mountain districts, and of Prof. Dr. Wahn-schaffe, who surveyed the low-lying plains, the two regions being practically separated by the contour-line of 650 feet (200 metres). No part of the Oder basin rises above the snow-line, so the term "mountain region" is used in the same sense as in the geography of this country, and includes everything more than 1700 to 2000 feet above sea-level, leaving the 600 to 1700 feet belt as "hill country." For geological purposes, the two arrange themselves into (1) the Sudetic mountains, and (2) their subsidiary ranges, (3) the Beskids, and (4) the Upper Silesian plateau; but the Sudetic mountains are understood to extend only from the Lausitzen Pforte to the Mährische Pforte, and to include the Riesengebirge, Eulengebirge, and Altvater groups, characterized by a bed of crystalline schist, which, although the oldest formation here, overlies most of the more recent strata. Special interest attaches to the northern diluvium, which here, as elsewhere in North Germany, occurs up to about 1600 feet above sea-level. The distribution of this deposit has been found to extend over a much wider area in the Sudetic range than was supposed, a point of much importance on account of the different permeability of the soil, and consequent change in the amount of drainage which may be expected to find its way to the various feeding streams.

The low plains of the Oder basin are almost entirely covered with quaternary deposits, but here and there these are so thin that the tertiary strata have become exposed, and the river itself has of course made a number of sections. The tertiary rocks appear most frequently in the neighbourhood of Brieg, to the north of Breslau, south of Liegnitz, and round Posen, but especially in the basin of the Warthe, and they consist chiefly of middle and upper Oligocene and Miocene beds. The quaternary deposits are the diluvium and the alluvium, the former the work of the Russo-Scandinavian ice-sheet, which is now known to have overspread North Germany twice, with an inter-glacial period interpolated, and the latter the result of agencies at work since the total disappearance of the ice-sheet.

THE TEACHING OF GEOGRAPHY IN RELATION TO HISTORY.*

By A. W. ANDREWS.

MUCH has been written about the teaching of geography, but, unfortunately, the improvement in English schools of this subject has been most disappointing. Its educational importance is, however, so great that I may perhaps venture to make a few practical suggestions on a side of the subject which has been somewhat neglected. It is only by systematizing the teaching of geography, especially in its early stages, that we can hope to train future geographers, and obtain for geography in English education the honoured and important position that it holds on the continent.

At present, in most English schools some time is devoted to the teaching of history, and in a few there is a systematized teaching of geography; but, unfortunately, the two subjects are taught in almost complete isolation. At first it seems almost inconceivable that this should be so, and certainly it is not from any lack of theory on the subject. To quote merely one or two names: Ratzel expressly declares that geography is by no means a *Hilfswissenschaft*, or subordinate branch of history, but that the two sciences need one another and cannot be separated. Herder, again, in an inimitable definition, tells us that history is geography set in motion; and Michelet goes so far as to say, "*L'Histoire est d'abord toute Géographie.*" Finally, to quote Sir A. Geikie, whose admirable book on the teaching of geography should be in the hands of every teacher. "Few observant teachers will refuse to confess that the historical side of political geography is generally in this country either neglected altogether at school or is treated in the most meagre and perfunctory way. . . . The present political limits of a state are too often supposed to have the same kind of stability as if they had been boundaries fixed by nature. When France of the fifteenth century is spoken of, what proportion of readers has any notion of the difference between what *was called France then and what is France now?* Yet surely history cannot be intelligently understood unless such distinctions as this are kept in view.

"It is hardly possible to exaggerate the importance, in geographical teaching, of connecting the present aspect of the country and the present political boundaries and social conditions with those that preceded them, and out of which they have gradually grown. It is only in proportion as we realize what has been that we can properly appreciate what is. And yet how constantly do we see geography taught as if the existing state of things had always been maintained; as if, for instance, the modern limits of countries had the same persistence and fundamental character as geological boundary-lines. Obviously the study of the present must come first, but we should never forget that the result must necessarily be superficial and imperfect, until it has been connected with an inquiry into the past."

One would fancy that a practical people like ourselves would have utilized some of the abundant theory and material that lies within easy reach; but, unfortunately, there is nothing in which we are more conservative than education. Mathew Arnold's famous lines in '*Empedocles*' or '*Etna*' might have been specially written for educationalists:

"And so they rubbed through yesterday
In the hereditary way;
And they will rub through, if they can,
To-morrow on the selfsame plan."

* Paper read at the Royal Geographical Society, February 18, 1897.

The fact is that all practical teachers are, and rightly so, in great fear of facts and fallacies, but it is obviously absurd to carry this conservative and precautions attitude too far. There can be little doubt that, without any radical change, and with a slight addition to the time at present spent on history alone, the study of history and geography in connection with each other would, in the hands of capable teachers, produce a result of almost tenfold value to education. To obtain this, the study of the physical geography of a country must precede and be co-extensive with the study of its history.

I think it will be generally admitted that the ideal of history teaching in English schools should be to teach the student to reverence the great deeds of his ancestors, to understand his responsibilities as a citizen of a great empire, and, above all, to appreciate the causes which have contributed to the making of England and Greater Britain. As taught at present, even by the most able teachers, there is what one may call a lack of perspective in the teaching of English history, owing to the neglect of physical geography. It is true that good historians and teachers of history have all, consciously or unconsciously, been geographers. It is perhaps sufficient to allude here to Green's admirable geographical work, especially on the 'Influence of the Forests in checking Invasions,' and they have themselves appreciated the importance of physical factors; but they are apt to forget that the student has not done so, and they consequently relegate what I may call the physical side of history to special text-books or special lessons. There is, therefore, this great difficulty to start with, in trying to obtain an adequate recognition of the place of geography in the teaching of history, that there are no convenient text-books to which the teacher of, for example, English history can refer for information as to the geographical side of his work. He can, of course, obtain this information from geographical text-books, but unless he deliberately takes this trouble—which, unfortunately, seems to most teachers to lead them to work quite outside their province—and can also induce his pupils to study geography, he will of necessity almost entirely neglect the geographical side. Unless the teaching and reading are systematic, they can be of little use.

The few isolated allusions to the physical geography of a country made by history-teachers, or scattered through text-books, are, as a rule, of little practical value, because the student has not sufficient knowledge of the subject to understand their importance. It would be quite as unreasonable to expect any one to have a clear idea of the relative position of peaks in a mountain range of which he has only caught fleeting glimpses through the mist.

It may, perhaps, be objected that historical atlases—and what could be more geographical than an atlas?—are always used by all good teachers in the teaching of history. But if you examine what are usually called historical geographies and historical atlases, you will find that they are almost entirely topographical; that is to say, they deal with the distribution of names and the changes of political boundaries. Some, such as 'Gardiner's Student's Atlas of English History,' are of immense value for the teaching of history, and I can imagine nothing more instructive than to compare the maps of England of about 1400 with those of the present day, and observe how few of the modern manufacturing towns of Lancashire were even marked at the earlier period. But teachers are apt to forget that a topographical map is merely a diagrammatic method of showing statistics referring to the relative positions of names.

It is true that a physical map is also a diagrammatic method of showing the distribution of rivers, mountains, etc., and that it can be used equally badly, but fortunately hardly any student attempts to learn a physical map by heart. To know where places are and their distance apart has a distinct value in the

intercourse of everyday life, but no one as a rule wishes to know the exact shape of mountain ranges or the position of contour-lines for their own sake, but only for the information given by these symbols with regard to the country. A student, therefore, does not attempt to commit a physical map to memory any more than he does a landscape, but only attends to and remembers those details which help to illustrate his line of thought.

To take a concrete instance: a boy, looking at a topographical map of England, remembers the positions of London and Liverpool from the picture imprinted on his mind of the names London and Liverpool, written in a certain type at opposite corners of the map. He has now got all he wants from the map; that is, the relative positions of the two names representing the towns London and Liverpool, in much the same way and with as little reasoning as he has learnt the position of two benches in his schoolroom. But he can hardly look at a map of India and see the Himalayas with the plain of the Ganges below, or of Switzerland and see the plain of Lombardy between the Alps and Apennines, without thinking of what these lines and dots represent, and reasoning somewhat as to how these mountains and this plain must affect the people who live there.

The above example of the misuse of a topographical atlas is particularly fruitful, because it illustrates an unfortunate tendency to make English history a mere verbal record of statistics, in the way that a topographical atlas is a diagrammatic record of statistics. To understand history, the student should be able to have in his mind at any one epoch (for example, 1380 in English history, at the time of Chaucer), a picture of the state of England, as clear as the student who has studied the present geography of the British Isles has of the whole British Isles and the relation of the different parts to the life of the whole.

But, as a rule, even the best student has no such clear view. He may have studied the growth of English institutions, and be able to understand the development of our complex system of law and custom; or he may know the history of parliament or the foreign policy of different reigns and epochs, or possess a connected idea of the development of English literature and manufacture; but, however thoroughly he may understand each branch (and it must be remembered that I mean a knowledge of English history far more complete than a mere acquaintance with dates and genealogies and great events), he is apt to become confused when he tries to put these different streams together and form a clear picture of life in England at any one time.

In the study of history there must be constant comparison and contrast, and the student has usually no clear idea of any one epoch with which he can constantly compare and contrast others. If, however, he knew something of the present physical geography of the British Isles in conjunction with some of the main ideas of the history of our own times, a knowledge that he would be able to continually expand from his own experience, he would possess something certain with which he could compare other epochs.

One of the strongest reasons, therefore, for the study of geography in connection with history, is that it would give the student a firm standpoint. It may also be added that, as the pressure of other subjects in schools often makes it impossible for a student to gain any but a disconnected knowledge of certain periods of history—I know many people who have never got beyond the reign of Queen Anne—if he began with geography, he would at any rate possess some certain and valuable knowledge, in addition to a training in what is, as every one must admit, one method of understanding history, *i.e.* from the geographical side. He would probably in this way make far more use of any scraps of historical information that came in his way in after-life.

As an example of how one of these epochs might be studied, and how enormously the early training in physical geography would help the student, I will take the times of Chaucer (about 1380). I must first, however, explain what geographical knowledge the student should bring to the study of this epoch. It would, perhaps, be well at this point to answer a possible objection to the study of geography in connection with history, namely, that geography is a science, and should take its place among the sciences. It is quite possible that one of the obstacles that have hindered its introduction into schools has been that the teaching of geography has been confounded with that of the sciences from which it draws its materials, and that in consequence the teaching of geography is considered as simply an extension of science-teaching. It is obviously far more important, to take an instance, that a boy should understand the part that Vienna played in history as one of the outposts of civilization, than that he should know the rainfall of Vienna, and I can understand a teacher who regards geography in this way failing to appreciate its importance for history.

But it must not be forgotten that geography gives us the causes which made Vienna what it was, and that the rainfall was only one, and possibly the least important, of the factors. There is, therefore, a real danger to be avoided in the teaching of geography in English schools, which lies in the manifolding of statistics, whether these consist in diagram maps or lantern slides. This, however, is simply due to a bad selection of the materials, and need not prejudice geographical teaching.

I might here point out, with regard to the admirable lantern-slide maps which have been and are being prepared by the Geographical Association for use in schools, that they are not, as some teachers have thought them, a royal road to geography, but simply a convenient diagrammatic form of showing statistics. It would seem unnecessary to mention this, if I did not know that many teachers have actually shown a series of these maps, comprising population, rainfall, language, physical features, etc., just as they would have shown a series of views. Lantern-slide maps are, however, if properly used, of immense value, as they can be seen by large audiences, and save great labour in the preparation of wall maps.

To return to the consideration of the preliminary study of physical geography in connection with history. This should in no way differ from the training in *observation* which has so often been described by numerous authorities; I need only refer here to "Geographical Education," by A. J. Herbertson, in the *Scottish Geographical Magazine* for August, 1890, and other months. The early training in geography must be partly scientific, and in connection with the sciences, such as meteorology, geology, botany, chemistry, etc.; that is to say, a boy must first be taught to observe the laws of nature and physical conditions that determine the environment of his school and home. It is not, however, necessary for the special purpose in view—the geographical training necessary to understand history—to carry this too far. To take an instance, it is not necessary to be a meteorologist to understand the influence that climate has exerted in the past and does exert in the present on the history of life and race, in Ireland and the west of the British Isles, any more than it is necessary to be a statistician to know something, in the ordinary study of English history, about the increase of population at different epochs. Unfortunately, this training stops short, as a rule, with *observation*, but to be of any use it must go much further, and lead on to the comparison and contrast of the district he knows with the rest of the British Isles, and, in less detail, with Europe and the British Colonies.

The geography of the world must, of course, not be neglected, but it should only come after the study of the countries which are in more intimate relation with his home. In fact, both in the early training in physical geography and

subsequently, the student should be taught to look out for the relations which subsist between different towns, districts, and countries. These are obviously not determined by distance, *e.g.* if you post luggage from Grindelwald to Brigue in the Rhone valley, a few miles distant, it goes about 60 miles round by Berna, because it can be sent by rail round the great mountain basins. They are even not determined entirely by facilities of communication, as Manchester discovered, when it hoped to tap the ocean trade directly by the ship canal, without unloading at Liverpool. There are many reasons, such as custom, interest, etc., which often bind two towns, districts, or countries together between which the facilities of communication are far less than between either of them and a third.

I have mentioned this because there is a danger, in the teaching of geography, to imagine that it should be taught—in spite of the repeated assertions of many eminent authorities, that to proceed by political divisions, township, country, etc., is to violate the fundamental idea of home geography—beginning from the Home, or *Heimatkunde*, in the order in which places or districts lie on the map, or even, as some one has pointed out, in the order in which maps are bound in an atlas! I have known many a boy who has studied the geography of North America, and has then been taught South America because it came next, and consequently has never reached India at all. It is surely, however, as unreasonable for any one to do this in geography as it would be in history for an English boy to study first some country like China, whose story is least intimately bound up with that of the British Isles. If, however, geography and history are taught in connection, the order of study presents no difficulty, as the countries of Europe, United States, India, and the colonies will naturally be studied *first*, in connection with the main points of their history.

With this preliminary knowledge of geography, the student would possess a firm standpoint with which to compare and contrast such an epoch as the times of Chaucer (1350 to 1400). I will take three headings, which of course are in no way exhaustive, for the study of that epoch from the geographical side.

A. CAUSES WHICH LED POPULATION TO CENTRALIZE AT DIFFERENT POINTS.

I will confine myself to one instance.

L'Point of Exit. Harbours of England.—This gives an opportunity for a most instructive comparison.

There happens, in the year 1347, to be a record of the number of ships supplied by the different ports to the Calais expedition.

The Cinque Ports supplied about one-seventh of the whole number of ships and men, and the largest vessels were contributed by Yarmouth, Dartmouth, London, Bristol, and Southampton, which is sufficient to show that the populous centres of England were mainly in the south-east and south-west. If the student compares this with the present position of British ports, with which he is already acquainted, he will be able to appreciate the influence of geographical conditions in history, and to understand how the modern port of Liverpool, which sent on that occasion a bark and six men, was able, as the outlet of great coal, iron, and salt mines and populous manufacturing towns, to triumph even over Bristol with its exceptional tidal advantages, its central position and easy communication with the Trent and Thames, and its proximity to the metalliferous ores of Cornwall and the coalfields of Wales.

The history of the Cinque Ports, which were even then past their prime in consequence of the decay of their harbours, presents an exceptionally good object-lesson of the way in which a change of physical conditions has influenced history. The causes which led to the destruction of the harbours of Romney, Rye, Winchelsea,

and Sandwich, to take the most striking instances, were twofold. Sandwich is particularly worthy of notice, as it was originally one of the old ports of London on the river Wantsum, which separated the Isle of Thanet from Kent; it is also mentioned in Domesday Book as the most useful national port for defence; its importance is further shown by the fact that it was the headquarters of the Danish fleet when they invaded England. The waste of sand which now separates it from the sea was due both to the influence of physical conditions and the influence of man. The physical causes were the south-west winds and flood-tides, which carried with them the sand and gravel procured from the old sea-beaches and from the masses of material washed down from Sussex valleys to the sea, and left them in places where eddies were produced by the meeting of the tides and the consequent slackening of their pace.

This was greatly accelerated by the influence of man, which was shown in the "inming of the marshes," or reclamation of the waste land covered by the tide. In this way the mouths of the rivers and the harbours were gradually choked up by the accumulation of sand which had formerly been spread over a larger area.

The physical changes that have influenced history should be continually kept in mind by the student.

I cannot do more here than mention one or two towns and districts whose position has been completely altered in historical times.

The old Roman port of Rutupiae, which in Saxon times bore the name of Richborough, was deserted by the sea, and gave place to Sandwich.

Reculvers, or Regulbur, the old capital of the Saxon kingdom, was originally at some distance from the sea. The tide, however, has at that point eaten so deeply into the soft cliffs, that it was found necessary to protect the church, which served as a landmark to sailors, by constructing a sea-wall.

Lastly, I might mention the coasts of Norfolk and Suffolk, where the sea gains incessantly from 6 to 15 feet per year, and where churches, as at Eccles by the sea, have been actually buried in the sand. To give one striking instance abroad, the town of Adria, which gave its name to the Adriatic, is now 14 miles from the sea.

I think there can be no doubt that a student, who at this epoch (1350-1400) had some knowledge of the chief physical causes that had influenced and were influencing the growth or decay of towns and populous centres, would be in a far better position to understand history. There would certainly be some difficulty in obtaining what I may call diagrammatic material, for except with regard to political geography, none exists at least in an accessible form.

There exist, however, sufficient details for the preparation of rough maps illustrating the following points at this epoch, to take a few instances, which should be compared and contrasted with similar maps of the present day—

Maps and Diagrams (1350-1400).

A. CAUSES WHICH LED PEOPLE TO CENTRALIZE AT DIFFERENT POINTS.

1. The population of the British Isles.
2. The proportion of people in town and country.
3. The British Isles, showing, say in red, where physical changes have taken place from 1350 to the present day, and in blue from our earliest historical records up to 1400.
4. The agricultural, fishing, grazing, and industrial districts.
5. Distribution of forests and swamps and unreclaimed land.
6. Harbours, showing depth and capacity, and arranged in classes according to

their relative value. In this case 1, 2, 3 should correspond to a similar enumeration at the present day; a first-class harbour at both epochs being marked with 1.

7. The towns which were of most importance at that epoch.

8. The distribution of monasteries, fairs, and the sites to which pilgrimages were made, e.g. Walsingham, Norfolk.

I can imagine no more instructive course of study than to take the main towns of importance at this epoch, such as Bristol, York, Yarmouth, etc., and show how their history has been influenced by physical conditions. How far it would be possible to deal with this, except in its broad outline, in teaching the physical geography of the British Isles at the present day would naturally depend on the pupil. At any rate, he should know the physical conditions which have determined the growth or decay of towns in his own neighbourhood, and the meaning of those topographical names which are a clue to the early geography of the district. It may be said that this will entail more work than a student can possibly do, but I think that if the information were systematically arranged in a diagrammatic form for some dozen epochs in English history, separated by from fifty to one hundred years, each of which might be studied in some three or four lessons, that it would give the student a firmer framework on which to build up history than a mere knowledge of dates and great events.

B. My second heading is "Means of Communication." It is difficult to realize the life of a time when goods were brought into London by barges or on a pack-horse by the narrow footway of old London Bridge with its shops on both sides, or the old roads, which were often so bad in winter that Parliament was unable to meet because members were detained a few miles out of London. The student will, however, see this more clearly if he is able to compare that time with the present, with its railways and steamships and canals and all the modern facilities of communication. Under this heading it will be useful to group the main lines of communication of the time both with the British Isles and with other countries; e.g. it should be mentioned that, as the Cape route had not yet been discovered, the trade from the East passed largely through the Mediterranean, and was controlled by Venice and other Italian cities, and not by English merchants. I think it must be clear that a knowledge of the main lines and facilities of transport at that epoch and comparison with the present would help enormously to understand its history.

Maps and Diagrams (1250-1400).

B. MEANS OF COMMUNICATION.

1. Roads and bridges (the maintenance of which was a matter of national importance).

2. Navigable rivers.

3. Sea routes and overland routes of Europe, showing the course of trade, the influence of the Hanseatic League, Venice, etc., and the position of British navigation.

C. THE INFLUENCE OF GEOGRAPHY ON THOUGHT.

As a third heading, it would be interesting to take such a subject as the influence of geography on thought, which really embraces two different ideas: (a) The influence of geographical knowledge on thought; (b) the influence of geographical conditions on thought.

Maps and diagrams under this heading might perhaps consist of—

1. The geographical knowledge of an educated man, such as Chaucer, who had

been on a campaign to France and a diplomatic mission to Genoa, and whose characters in the 'Canterbury Tales,' such as the Wife of Bath, who had been in Palestine, and the Knight in Lithuania, fighting against the pagans, prove that their author possessed a considerable knowledge of European geography. It is in this way that we can approximately estimate the knowledge of foreign countries possessed by the man who acted as Foreign Minister, a consideration of enormous importance in considering the foreign policy of England.

2. It would be interesting, though not so important and more problematical, to estimate the geographical knowledge of the different classes of society who are represented by the characters in Chaucer's 'Canterbury Tales.' I may here mention that the student would already possess maps of the probable geographical knowledge at at least two epochs between 1066 and 1350, showing the influence of the conquest, and the Crusades. Chaucer's Knight must have had many opportunities of seeing foreign lands—

"At Alexandre" he was when it was won;
Full often time he had the board begun;
Above all nations in Prusse."

It was the custom for knights in the fourteenth century to fight in Prussia for the Teutonic Order against the heathens. He had also been in Lithuania, Russia; in Granada, at the siege of Algexir (1344); in Africa; at Lays in Armenia, and Satalie, the ancient Atalla, both taken by the King of Cyprus, the former in 1367, the latter in 1352; also in the "Great Sea" (the Mediterranean), in Anatolia, and in Turkey. Chaucer's Shipman represented the class of sailors and traders who were laying the foundation of England's future greatness. "He was the best pilot from Hull to Carthage," which shows that at least the west of the Mediterranean was open to bold and enterprising mariners—

"He knew well all the havens as they were,
From Scotland to the Cape of Finisterra;
And every creek in Bretagne and in Spain."

Scotland is in some editions Gothland. In any case, his range was over the whole of the North Sea and the Atlantic seaboard. In this way it is also possible to connect geography and literature.

In Chaucer we have actual contemporary material, but when that is not available it is quite easy to find modern writings that refer to ancient times, e.g. Macaulay's 'Armada,' which should be read in conjunction with a map showing where the places mentioned are situated.

Chaucer's Wife of Bath had been a great traveller; besides that—

"Of cloth-making, she hadde such a haunt (custom),
She passed them of Ipres and Ghent."

Talis is most interesting as showing the native woollen manufacture.

"Theris had she been at Jerusalem
At Rome had she been, and at Bologne,
At Galice, at St. James, and at Cologne."

Other headings might be—

1. The influence of geography on literature.

* Alexandria taken in 1365 by Pierre de Lusignan, King of Cyprus.

† Begun (sat at the head of the table).

4. The distribution of languages and dialects.
5. The proportion of foreigners in England and of Englishmen abroad; the knowledge of foreign languages in England, and of English by foreigners.
6. The influence of geography on education.
7. The distribution of religious beliefs.
8. Districts of Europe possessing the closest relations with English life, especially the main towns of the Netherlands, *e.g.* Middleburg of Chaucer's merchant: "He would the sea were kept for anything between Middleburg and Orewell." Orewell was the port of Ipswich, and the trade was considerable between these places. Also of France, *e.g.* Bordeaux, which belonged to England, Chaucer's Shipman: "Full many a draught of wine he hadde drawn, from Bordeaux wood while that the chapman sleep."

In this connection it is important to notice that the history of Europe should be studied in its broad outlines at each of these epochs, such as 1350-1400, so far as it is necessary to understand the relations of Europe and the British Isles. The events in the history of France, for instance, which affected the British Isles at that date should be studied at the time when the student is considering the history and geography of that epoch of the British Isles, and not, as is the case now, omitted or left for some future time when he may study the history of France. It will be remembered that this will not entail any great additional work, as the student will already have some knowledge of the geography of France and the main points of its present history. It would, of course, be difficult and even unnecessary to put all these points in a diagrammatic form, but I think that the attempt to do so would give them clearness, and open a student's eyes to many new and instructive problems.

It will possibly be objected that the history of the English people must necessarily be studied as the history of their gradual evolution, and that these periods will overlap so much as to make it difficult to obtain any concise and definite idea of their position at one epoch. If, however, we take the illustration of a child growing up to manhood, we always find change and progress, and yet it is possible to take a photograph or draw a character at one definite epoch in that evolution. Possibly, like the conventional picture of the trotting horse, it may never be *exactly* true, but it will be sufficiently so for ordinary purposes. These periods or epochs selected may be considered as a series of photographs of the life of the English people at different ages, intended to add vividness to the study of history.

A consideration, therefore, of the geographical conditions at this epoch would undoubtedly give the student a standpoint from which to obtain a clear view of the different streams—such as literature, trade, social life, etc.—which make up the history of that time. Every one of them, he will find, was influenced by the geographical conditions, and geography will therefore be seen to form a common bond which unites the threads of history. It is difficult to understand why history and geography have not always been taught in connection, but it may perhaps be due in England to the fact that we have no great physical features that absolutely force themselves on our attention. In countries such as Switzerland the forces of nature are so overwhelming that geography naturally takes an important place; but in England teachers seem to think that a few platitudes—such as our insular position and the influence of the Gulf Stream—constitute all that there is of importance for history. It is, however, only possible for a student to really appreciate history when he understands the great truth, that the widening of the horizon of thought has been, in the main, coextensive with the widening of geographical knowledge.

Consider for a moment the great geographical discoveries of the two centuries that followed 1400: the discovery of the route round the Cape of Good Hope and of America, which led the way to further explorations, out of which has grown our colonial empire. Take the great invention of the fifteenth century—printing. Would it have exercised the same world-wide influence or thought, at any rate with the same rapidity, if it had not occurred simultaneously with the extension of geographical knowledge? Imagine for a moment the infinite extension of thought that would result by the spread of geographical knowledge in China, if it were only possible to substitute a training in history and geography for the maxims of Confucius. It might be difficult to break through those traditions, which have been the outcome of geographical conditions and centuries of isolation—we know from experience how little the Chinaman abroad differs from the Chinaman at home—but it would certainly, in time, produce an enormous change in the destinies of the East.

In concluding this short paper, in which I have endeavoured rather to enunciate a principle than to set forth a method of teaching geography, I should like to call attention to three of the main advantages of teaching geography in connection with history.

I. A study of the physical geography of the British Isles and of Europe would give the student a firm standpoint for the comparison of the present and past in English history, and for the appreciation of the main lines of the history of Europe which affect the British Isles.

II. It would assist a student to visualize history, i.e. to call up in his mind pictures of places and scenes, for he would be learning the history of a country he knew as a whole, not, as at present, of a country of which he knows next to nothing. It might be said without exaggeration that the majority of English boys know as little of the geography of England *as a whole* as they know of France, and, if they were set to learn the history of France instead of England, could hardly be more unfamiliar with the country they were studying.

III. It is the one factor of history that it is impossible to teach in a cut-and-dried method. To take merely the instance of the geographical position of towns, a student who appreciated that such cities as Geneva and Basle were founded on the cross-roads followed by ancient migrations; or like Toulon, where a river became navigable; or like London, on the limit of a tidal estuary; or Guildford and Dorking, founded at the passes through the northern Downs; or Turin, as the warden town of a valley flanked by the Alps,—could hardly fail to think, and so fulfil what is, after all, the main aim of education.

Provisional list of epochs and maps desirable for their study—

1. The home district.

2. The geography and history of the present in its main outlines, especially of the British Isles and Europe.

(This is to be built up from the student's personal observation in the home district, progressing from the known to the unknown.)

3. Epochs of English history and geography.

(To be built up from 2.)

A. ROMAN PERIOD.

1. B.C. 55. Invasion.

The British Isles.

(1) Tribal divisions and languages.

(2) Degrees of civilization.

- (3) Towns founded before 55 B.C., and names that existed before the Roman conquest. Of Celtic names, Thames, Severn, Tamar, Kent.
- (4) Population.
- (5) Proportion of people in town and country.
- (6) Agriculture, pasture, etc.
- (7) Distribution of forests.
- (8) Harbours and navigable rivers.
- (9) Communication with continent.
- (10) Physical map, showing changes before 55 B.C.; after 55 B.C. to 1890.
- (11) Geographical knowledge of the time.
- (12) Europe.

- II. A.D. 100 } Administration.
A.D. 410 } Abandonment.

Most of the above maps should be repeated for this period, to show the effect of the Roman period. To them might be added—

- (1) Roman divisions of Britain.
- (2) Roman roads and bridges.
- (3) Roman stations.
- (4) Roman walls.
- (5) Areas of resistance to Roman influence.
- (6) Population, Roman and native compared.
- (7) Roman towns and names in Great Britain, etc.

(These maps can, of course, be added to or omitted. It is advisable that each diagrammatic map should only show one set of statistics.)

The teacher will, of course, have to make his own rough maps, as the only easily available map of the period is the first in Gardiner's 'School Atlas of English History.' This is the only map in the atlas which is not solely political. It contains the roads, walls, and Roman stations, and shows the fens, Romney marsh, and the Anderida Silva. It is, therefore, of great value so far as it goes, as it shows the kind of map desirable.

B. THE SAXON PERIOD.

A.D. 410-832.

C. THE PERIOD OF DANISH INVASION AND RULE.

A.D. 832-1066.

D. THE NORMAN CONQUEST.

A.D. 1066-1154.

E. A.D. 1154-1327.

F. 1327-1415 A.D. *Times of Chaucer.*

G. 1415-1558 A.D. (Invention of printing, gunpowder, fall of Constantinople, discovery of Cape route, etc.)

H. 1558-1616 A.D. *Shakespeare and discovery.*

I. 1616-1689.

J. 1689-1750.

K. A.D. 1750-1832. (Manufactures.)

L. 1832. (Beginning of railways.)

No stress is laid on any of these periods or dates, because it is strongly inadvisable to attempt to divide history too strictly into periods, each necessarily overlapping the next. There is, however, no doubt that a dozen *photographs* of the geography of the British Isles, in the form of diagrammatic maps, taken for one

year in these or similar periods, would be of enormous help to the student, as they could be studied backward as well as forward, and continually compared and contrasted with the present.

Before the reading of the paper, the Chairman (Lieut.-General R. STRACHEY, Vice-President) said: The paper about to be read to you is on a branch of education than which nothing can be more important. Of the many branches of study and education, for the purposes of which a knowledge of geography is desirable, none in which its importance is so great as history. You may say that, for the proper treatment of history, a knowledge of geography is not only desirable but essential. I am not going to give you a lecture on the subject myself, but merely say that I am much impressed with the importance of the subject. I have no doubt it will be well treated of by Mr. Andrews.

After the reading of the paper, the following discussion took place:—

MR. G. G. CHISHOLM: I came here this evening without any intention of saying anything at all on the subject, but I have listened with great interest, and have not the slightest hesitation in seconding, in the very strongest possible manner, the general views expressed. Of the importance of teaching the physical features of a country with reference to the study of history, I think there can be no doubt whatever. The proper study of physical features is essential in all geography, whether it is studied with a view to history, or commerce, or strategy, or any other purpose, and we are indebted to Mr. Andrews for having brought the matter before us, because, while it is the case that it is highly important that physical geography should be made the basis of all rational teaching of geography, it is equally true, and lamentably true, that it is to a large extent neglected, and I admit that the neglect is peculiarly glaring in the case of historical atlases. Why it should be so, I am unable to say, but, as a matter of fact, the historical atlases usually published contain no physical features whatever, or very scanty features. I will say nothing at all about the interesting illustrations Mr. Andrews has furnished, but I would only add that, while it is very important that in the teaching of history, its relations to geography, the effect geography has had upon it should be clearly brought out, there may be a tendency to go a little too far, and to give, especially young pupils, a feeling that all history may be explained as a deduction from physical features. Of course that is not the case, as Mr. Andrews is very well aware. At all times political and economic, as well as other conditions must be taken into account. Of the importance of keeping political considerations in view, a very good illustration is afforded by the seaport of Antwerp. No one, looking at Antwerp in the best physical map, will be able to understand why it was that Antwerp was so late in becoming an important rival of such places as Bruges, and one cannot understand it without seeing a map of the Low Countries as they existed in past times. But even after the physical conditions had come to tell in favour of Antwerp, the geographical value of that port was entirely destroyed for centuries by political conditions. Before sitting down, if I have not trespassed too much on the time of the audience, I would like to mention one thing in connection with one of Mr. Andrews' last suggestions—that it would be a good thing to have some kind of map giving an idea of what distances were with regard to time in the past. Well, that is a very interesting suggestion, and the French, with their usual ingenuity, which I think they often show, particularly in the construction of diagrams, have illustrated this point by means of concentric maps of their own country. The outermost map shows the time taken, say, one or two hundred years ago, to travel from Paris to Marseilles or Calais, while the

innermost is on a scale proportioned to the time taken at the present day. They are, I believe, official maps, but the example I have seen is in a book by M. Dubois.*

Mr. J. B. ROUSSON: I do not know that I can add much to what the lecturer has said. I have long held strong opinions as to the effect of geographical features on the history of a country. Taking the country I knew most about—Ireland—the great central plain enabled the Ard Rígh, or high king who had his seat at Tara, in the neighbourhood of the district Mr. Andrews has marked as "The Pale," to dominate the sub-kingdoms in the mountainous districts round the coasts; and these mountainous districts prevented the complete conquest of these sub-kingdoms. Even at the present day the physical features affect the politics of districts in Ulster. For example, the only district in County Down which returns a Nationalist is that surrounding the Mourne mountains, where the old race found a refuge. The importance of Belfast arises from its position at the mouth of the river Lagan, where a sandbank (from which Belfast takes its name) allowed communication by a ford between the portions of the old kingdom of Dalriada. We must not, however, carry the influence of geographical features too far. In the case of Belfast, part of its prosperity arose from the fact that in the last century, the Earls of Donegall, who owned Belfast, being in want of money, were compelled to give leases for ever at nominal rents on payment of heavy fines. To show how this acted, a firm of manufacturers, wishing to establish a factory at Lisburn, were unable to obtain a lease of sufficient land there from the Marquis of Hertford except for a short period, and consequently established their works at Belfast, where conditions were more favourable. One important consideration deserves notice: How are we to teach the teachers? The teaching of history lies chiefly in the hands of classical masters, most of whom have a contempt of geography, and, in my experience, strongly advise their boys not to attend any special class in geography. Such teachers cannot appreciate the influence of geographical conditions on history, and unless we can succeed in enlightening them, the teaching of history cannot be effective. I think Mr. Andrews has done a great service to geography by pointing out the absolute necessity of physical geography to the study of history, since it is impossible to properly understand history without it.

Mr. VAUGHAN CORRIEN: I hope that in recommending increased attention to the teaching of geography in connection with history, the recommendation will be, in the first place, to the universities and to the colleges which train teachers rather than to the schools, because a great many of the points which Mr. Andrews has mentioned are quite beyond the knowledge of most of the gentlemen who are entrusted with the teaching of history in schools, and I think that more harm than good would be done by inducing this physical teaching of history by the setting of questions at examinations for schools, where the men now in charge of the subject have not an adequate knowledge of physical sciences. I will illustrate my meaning by one particular case which Mr. Andrews himself has referred to in his address, in order to show how very special is the knowledge required for dealing properly with this subject. If you will look at Map 6, by Liverpool, you will see two curious indentations of the coast, one of which leads up to the formerly important port of Chester, and the other to Liverpool. Now, you will notice that the Chester estuary is a funnel-shaped estuary, the Liverpool estuary bottle-shaped, with the neck next the sea at the mouth. Anciently, of course, Chester was the important town; now Liverpool is the important town. Mr. Andrews referred to the importance of Liverpool as being due

* "La France et ses Colonies." Par Marcel Dubois (Paris, 1892), p. 259.

to its position with reference to the plain behind it; that would not explain the change in the relative importance of Chester and of Liverpool. That, I think, is due rather to the circumstance that the Chester estuary has silted up, and the channel at Liverpool has been kept open, owing to the fact that the estuary in one case is funnel-shaped, so that the ebbing tide loses strength as it flows out, whereas in the other case, the estuary being bottle-shaped, the ebb-tide gathers power as it goes, and clears out the channel, as Professor Lodge has pointed out. Now, matters such as that are beyond the physical science which is at the disposal of the average teacher of history in schools, even the highest schools, and until the gentlemen entrusted with the teaching of history (whose education is mainly literary) have received an adequate training in physical science, I think it would be better not to press for any very great development of physical geography in connection with the teaching of history.

MR. ANDREWS: I am obliged for your kind attention to my paper. I think we have struck the practical question that present historical atlases have not any reference to physical geography. Because we may go too far, because we have not competent men who can teach this, are we for that reason to neglect any opportunity of improving the teaching of geography and history? Is it not rather to be studied by beginning with the most simple things? There are in geography many simple points, such as a knowledge of distances and areas, and the obvious influence of physical factors, such as rivers, mountains, and climate, which are absolutely essential for the appreciation of history, and are not beyond the powers of any teacher. The problem we have before us is to encourage the use of good physical maps in the illustration of history. If we do this, teachers will gradually learn to make a fuller use of their materials, and we shall secure a certain though possibly slow advance. If we consider the excellent atlases used in French schools, and the thorough teaching of, at any rate, the geography of France, I think we shall feel that we are wanting in our duty as citizens of a great empire, if we do not do all we can to help boys and girls to know that empire, and learn the resources and extent of the heritage they will have to maintain.

LIEUT.-GENERAL STRACHEY: I am sure you will be prepared to express your thanks to Mr. Andrews for his very useful paper. For myself, I, as perhaps you may know, have tried my hand at producing an exposition of the view that should be taken of geography in connection with education in its broadest point of view, and I would say, generally, as regards the remarks that have been made by Mr. Andrews and the other gentlemen who have spoken, that there is no subject larger in its scope than geography. It comes into contact with not only every branch of science, but with every portion of history, going back to the very furthest to which anybody would propose to extend the designation history. The fact is, that the human race essentially depends upon the Earth, on which it has been developed under the influence of the features of its surface and the climate, and, as Mr. Andrews has, I think, usefully pointed out, the physical features of the different countries of the Earth have had most prominent and important effects on all that has happened in the past. As to deciding whether any particular mode of teaching is better than another, I am disposed to say, let each man try to do his best; there are many ways of teaching the subject, and the way to obtain progress in this, as in everything else, is for everybody to do his best to follow the road which to him appears most likely to lead to the result desired.

You will all join with me in thanking Mr. Andrews for his very useful communication.

THE MONTHLY RECORD.

EUROPE.

Local Geographical Work in Scotland.—No country in Europe has been less studied from the geographical standpoint than the United Kingdom, and the idea is widely prevalent that geography has no concern with the home country. Any intelligent study of local geographical peculiarities is worthy of being encouraged, and on this account we draw attention to three short papers recently presented to the library of the Society by Mr. David B. Morris, of Stirling, on the Raised Beaches, the Travelled Boulders, and the Glaciation of the Forth Valley. These are not mere compilations from existing writings, but, while recapitulating many facts previously known, they afford evidence of careful study in the field by the author. His point of view is rather geological than geographical, but the facts dealt with are common to the two sciences. It is interesting to note that the author turned his attention to the physical geography of his neighbourhood as a result of the stimulus afforded by a course of University Extension lectures on physiography.

Bibliography of Spain and Portugal.—M. H. Foulché-Delbosc has published (*Revue Hispanique*, 1896) a bibliography of travels in the Iberian peninsula of remarkable completeness and very thorough workmanship. On the principle that no document should be neglected in endeavouring to form a picture of the state of a country at any given time, he has aimed at completeness, not selection. He claims for the records of journeys a more vivid and picturesque truthfulness than is usually to be found in academic works, the labour of years during which primitive impressions have grown dull and facts have often been altered to correspond with new conditions. Thus, while conceding that part of the collected travels is useless, the bibliographer contends that the remainder is of incontestable utility. The numbered bibliography contains the records of 858 journeys from the second century down to 1895, but the editions and translations of these travels which are enumerated amount to 1730. The wideness of research is shown in a table giving the languages of the original editions, all of which, except about 60, were actually seen by the compiler. In French there were 313, in English 229, in German 123, in Spanish 107, in Italian 30, in Portuguese 11, and in ten other languages there were smaller numbers. In addition to a transcript of the title-page of each edition referred to, there are frequently short and interesting personal notes on the author or translator, and in almost every case an itinerary giving the names of the towns visited and the order in which they were passed through. In his preface M. Foulché-Delbosc mentions that he has compelled himself to identify all the place-names which in the originals are almost unrecognizable; he says nothing of the difficulty of the task he thus set himself, or of the great value to geographers and historians studying the past conditions of the peninsula of the assistance thus rendered. Articles in journals are included, as well as independent books. A full index of authors completes the work, to which we are tempted to wish that an index of place-names had also been added. This list must take a high place amongst geographical bibliographies.

ASIA.

A New Work on Mongolia.*—Although Mongolia lies close to the Russian frontier, and there is no lack in Russia of persons well acquainted with the

* 'Mongolia and the Mongols. Results of a journey to Mongolia, made in the years 1892-1893, by A. Fadineeff.' Vol. I. St. Petersburg: 1896. Published by the Russian Geographical Society.

Mongolian dialects, our knowledge of the inner organization of this wide country and the life of its inhabitants remains still very imperfect. The gaps in what is known about Mongolia were especially evident to such a specialist as the St. Petersburg Professor of Mongolian, A. Pozdnéeff, who has spent two years in Mongolia, in 1874-75, with M. P'yasetzky, and has been since teaching the Mongolian language and literature at St. Petersburg, publishing during that time a considerable number of monographs on the history, religious beliefs, and present condition of the Mongols. Consequently, Prof. Pozdnéeff was sent out again, in 1892, to Mongolia, where he spent two more years, visiting Urga, Khobdo, Ulyasutai, Kalgan, Khukhu-khota, and a great number of monasteries on his way, and studying the inner administrative organization of the Mongolian *khoshuns*, the religion of the Mongols, and their customs and manners of life. He was accompanied during this journey by his wife, Mme. Olga Pozdnéeff, who aided him greatly in collecting all sorts of ethnographical materials, and a young photographer, M. Zadoroff. The Russian Geographical Society proposes now to publish the results of this expedition in seven large quarto volumes, of which the first, containing the diary of the expedition for the year 1892, is now before us. The second volume will contain the diary for the year 1893. The next two volumes, being the results of studies in Chinese archives and Lamaite monasteries, will be given to the administrative organization of Mongolia and Lamaism under its dogmatic and moral aspects. The law which was issued in 1818, for the government of Mongolia, has been entirely modified since under the demands of the Mongolian common law; and as to Buddhism, it also has undergone in Mongolia a deep transformation, so as to totally differ from the Buddhism of Sakya-muni and the "Mahayana," which have lately been so much studied by West European specialists in Eastern Asia. The next two volumes will be given to ethnographical data and to information about Russian trade in Mongolia; and the seventh volume will contain the history of the princely families in Mongolia. The whole work will be illustrated by a great number of very interesting photo-engravings. Starting from Kyakhta, the small party went first to Urga, calling on the way at the Amar-bayaashulanta monastery, which is situated aside from the highway, and therefore was little known. The stay in Urga, the town of the lamas, permitted M. Pozdnéeff to give a detailed description of the different parts and institutions of this interesting town, where no less than 13,560 lamas are living in the monastery, divided into twenty-nine *aimaks*, their numbers continually increasing (they were 13,200 in 1877). The temples of Urga, one of which has the colossal idol Mäldari, 51 feet high, the shops, the lama part of the city, and its Chinese trading part, the beggars, and so on, are described in succession. From Urga the party went to Ulyasutai, and then to Khobdo, and the diary contains all sort of minute information about the organization of the posting-stations and the inner administration of Khalkha and Mongolia, as well as these two cities, which every year acquire more and more importance for trade. Good photographs illustrate the text, and the photographs of the old cemeteries and their stone monuments—especially the so-called "stag stones," that is, stones bearing some sort of wave and circle linear tracings in the stone—are full of interest. From Khobdo the party returned to Urga, visiting the monasteries of Tsain-khuré and Erdeni-tau, where Prof. Radloff has discovered, as is known, and copied most interesting old Mongolian inscriptions. Khobdo is said to have been founded in 1585, and has witnessed all the chief events—insurrections and grand religious ceremonies—of the history of Khalkha Mongolia. Every hillock, every flag-staff, and every temple or chapel of this monastery reminds the Mongol of some event in his country's history, and Prof. Pozdnéeff truly describes it as the Moscow of Mongolia, while Urga—the residence of the representative of Buddhist deity,

the *khutukhta*, and the seat of the lamas' administration—may be compared to St. Petersburg. The chapter of this volume which will most interest the reader is undoubtedly the chapter given to the subsequent incarnations (*khubilgans*) of the grand priest of Mongolia—the incarnated deity for all the Lamaistes—the Urga *Khutukhta*. After having undergone on our planet only fifteen incarnations since Sakia-muni's times (2596 years), the *Khubilgan* began to reappear in Khalkha Mongolia since the year 1635, which was fifty years after the acceptance of Lamaite religion in Northern Mongolia. At the present time, each new *khubilgan* takes place, as is known, in Tibet. After the death of the Urga, *Khutukhta* has been duly reported to Peking, an order is received from the Chinese emperor, enjoining "to elect the new *khubilgan* out of Tibet boys." The election takes place at Budala, in Tibet, in the presence of the Dalai-lama, the Baschen-bogdos, the Khan of Tibet, and a functionary who is sent for that purpose from Peking. Twelve boys are chosen for that purpose, and out of them three are definitely selected, not without all sorts of intrigues on behalf of their parents and relatives taking place. Their names are written on pieces of paper, which are put in an urn—the three representing a new reappearance of the *bodhisattva* in spirit, in word, and in body. The boy upon whose name it falls to represent the re-incarnation of the spirit is sent to be *Khutukhta* in Mongolia, while the two others are also consecrated as lamas, but remain in Tibet. Later on, a deputation, which makes a caravan of a thousand camels at the least, and costs Mongolia no less than about 450,000 lams in silver (about £50,000), is dispatched to Tibet to bring home the new divinity. The present *Khutukhta* is twenty-two years old, whose photograph and a by no means flattering description are given in the present volume. After a month's stay in Urga, the party continued their journey to Southern Mongolia, and went to Kalgan. This second part of the journey will be described in the next volume.

The Submarine Earthquake of Kamaishi on June 15, 1896.—Prof. Rein, of Bonn, contributes to the February number of *Petermanns Mittheilungen* an account of the effects of this earthquake on the coasts of Japan, based on an official report, on private communications from friends in Japan, and his own knowledge of the scene of the occurrence. The great waves that followed the shock advanced inland at the height of from 20 to 30 feet, in places even 50 feet, and in a few minutes caused the loss of life of about 27,000 human beings, besides injuring 5000 others and destroying about 7000 houses in the lens of Miyagi, Iwate, and Aomori, the chief centre of destruction being round the bay of Kamaishi, on the east coast of Honshu, in $39^{\circ} 16' N$. Within five minutes this town was almost entirely swept away. At various places some marvellous escapes are recorded. In one case some persons were found alive on an island about 6 miles distant from the point on the coast whence they had been carried away by a wave. A large schooner of more than 200 tons burden was hurled 500 yards from its anchorage and deposited almost uninjured on a field of wheat. On the plate accompanying this communication, containing a map from Hassenstein's atlas of Japan of the region affected, Prof. Rein has added the chart of the self-registering tide-gauge at Ayukawa, a station about 70 miles south of Kamaishi, for the twenty-four hours from noon on June 15 to noon on June 16, 1896. This shows that wide and rapid oscillations began at that station before half-past eight on June 15, and about noon the next day were beginning to die away. Outside of Japan effects of this shock have been observed at the harbour of Keahulu, in Hawaii, and at the mouth of the Rogue river in Oregon, but on this subject Prof. Rein proposes to send another communication, and asks for information of any unusual marine disturbances on the coasts of the Pacific Ocean between June 15 and 17, 1896.

Ancient Trading Centres of the Persian Gulf.—It should have been stated that the author of the paper in the March Number is Captain A. W. Stiffe.

AFRICA.

Lieut. Hourst's Journey down the Niger.—The full report of Lieut. Hourst's journey has been published in the *Comptes Rendus* of the Paris Geographical Society, 1897, pp. 24 *et seq.* As we have already noted the general outline of the journey (*ante*, p. 220), it is unnecessary to do more than to refer to some of its more important results in relation to the questions of the present political condition of the countries traversed, and the possibilities of navigation on the middle Niger. The countries of the Tuareg confederation extend over the whole left bank of the Niger from a little east of Timbuktu to Sansan-Aussa, north of Say. The Igwadaren, the first tribe reached from the north-west, inspired little confidence, being inveterate pillagers; but the Awellimiden, under their powerful chief Madidu, proved much easier to deal with. The influence of this chief was constantly manifested until the southern limits of the Tuareg countries were reached, and his friendship for the travellers smoothed over many difficulties. Although showing many defects, the Tuareg, according to Lieut. Hourst, possess two great virtues: they are absolutely true to their word, and they are never thieves (as distinguished from open plunderers). They are devoted to freedom, and in case of attack Madidu could place twenty-five to thirty thousand men in the field, so that the attempt to bring them under direct French control is not to be recommended. The only section of the race whose influence is to be compared with that of Madidu is the tribe of the Kel-es-Suk, who possess a certain religious and intellectual ascendancy. The Tuareg tribes are divided into two great classes—the Ihaggaren, resembling the feudal chiefs of the Middle Ages; and the Imrad, who, while occupying a lower rank, are often wealthy and influential. The domestic slaves, captives taken in war, are called Bellato, and form part of the family of their owners. The Aarma, like the Sonrai, are a subject Negro race, and serve as beasts of burden to their masters, but are well treated. Of the Tuareg towns, Gao, with neighbouring villages, has a population of four to five thousand inhabitants; while Sansan Aussa, on the southern frontier of the Tuareg country, is one of the principal markets on the Niger, though lately its trade has declined. South of the Tuareg countries, the empire of Rabba, who has taken Kano, is strong and well organized. Near the Niger a sentiment of independence is spreading, and Ahmadu, now established near Say, has not acquired much influence, albeit he has designs against Sokoto. The difficulties in the way of navigation on the Niger occur in two principal sections, the one extending for some distance above Say, the other occupied by the Bussa rapids. The former may be considered to begin below Gao, at Anzongo, in the territory of the Kel-es-Suk, near which four rocks bar the stream and mark the limit of regular navigation from above. Below this is a succession of rocks and rapids, which were all passed successfully by the expedition, but some with great danger. At the most difficult passage the navigable channel was little over 15 yards wide, with a current of about 8 knots an hour, and even this was partially barred, as it proved, by a concealed rock. The Bussa rapids begin below the town of that name. The river flows through several rocky passes—one of them little over 150 yards wide—with tremendous velocity. The same marvellous fortune which attended the travellers throughout was, however, experienced here, and all were passed in safety.

Mr. Weatherley's Visit to Lake Bangweolo.—The *British Central Africa Gazette* for January 15 contains some further details respecting Mr. Weatherley's journey to Lake Bangweolo (*ante*, p. 325). Owing to the rapid current of the

Luapula, progress by boat was so slow that the traveller left his crew to pole the *Vigilant* up the stream, and did the greater part of the journey to the lake on foot. The chief Chinyama proved suspicious, and rumours of an impending attack by Mieri-Mieri were circulated, but by showing a firm front this danger was averted, and threats of desertion by the men likewise came to nothing. Bangweolo was circumnavigated in the *Vigilant* with a crew of twenty-five men. Regarding the lake, Mr. Weatherley says, "The existing map is very much out, and the long adjoining lake, Chifunanti, is not inserted at all. A narrow sand embankment, say 400 yards in width, separates the two. . . . I fancy Bemba, or Bangweolo, is a good deal smaller than it is made out to be in maps. It looks enormous—a vast expanse of water, looking at it from the east or west coasts, as the land is so low." The character of the lake is that of an overflowing of the country at the base of the Tanganyika plateau by water from the latter. Nowhere was a greater depth than 13 feet and a few inches obtained. No shells were seen. The Chamberi is a small river, the marsh along its course being impassable for even small caucos in the dry season. The whole east side of Bangweolo is nothing but a sea of papyrus. Mr. Weatherley found that the Luongo river, which Mr. Sharpe considered as possibly identical with a channel entering the Luapula in 10° 11' S., really joins the latter above the Johnston falls.

Johannesburg.—A census of the town and district of Johannesburg was held on July 15 of last year, and the principal results are given in the table below:—

	Europeans and other whites.	Malays.	Indian coolies and Chinese.	Kaffirs.	Mixed races.	Total.	Males.	Females.
Town proper	35,868	500	3038	8,655	1290	48,351	34,105	14,228
Sanitary board area ...	39,454	948	4556	14,195	2199	61,292	43,729	17,563
Area of enumeration (28 square miles) ...	50,207	932	4807	42,533	2879	102,078	79,315	22,763

The town was founded on September 20, 1886; in April, 1887, had a population of 2000; and in January, 1890, 26,000. At the census of 1890, 68 per cent. of the population were between the ages of fifteen and thirty, only 21 per cent. above thirty. The disproportion of the sexes is not so great in the white as in the Kaffir population, 37 per cent. of the whites, only 4 per cent. of the Kaffirs, having been females. The origin of the white population within the area of enumeration, according to the place of birth, is shown in the following table:—

British Empire	31,023	Brought forward	47,536
United Kingdom	16,265	Netherlands	819
Cape Colony	15,463	France	402
Other British possessions ...	2,393	Scandinavia	311
Transvaal	6,203	Italy	266
Orange Free State	1,731	Rest of Europe	882
Russia	3,035	United States	616
Germany	2,262	Other countries	108
Carried forward	47,536	Total	50,207

The British element thus made up 67 per cent. of the total. Of the blacks, only 764 were natives of the Transvaal, 27,498 were from British South Africa, 14,085 from Portuguese territories. Of the total population, 93 per cent. was of foreign origin.

Geography of Africa.—The latest volume of Macmillan's Geographical Series is a compact little treatise on the geography of Africa by Mr. E. Heawood, whose long study of the geographical literature of Africa specially fits him for the work. While promising to be of great utility as a school-book for the higher forms, it may also serve as a handy summary of the main features of African geography for general reference. It is planned scientifically, so as to treat the continent from the fundamental physical conditions progressively to the present state of each of its great political units. The first chapter is a general survey of the physical geography, and it is followed by chapters on the Races of Man in Africa, Exploration treated historically, and Present Political Relations. The following ten chapters are devoted to the natural regions of the continent, and are treated in the same order as the general part, the physical features and people being first considered, then the political subdivisions and the progress of exploration and commerce, showing how means of communication and town sites have been determined, and the present condition of the country. The importance of such manuals on the continents, written by specialists who have mastered all trustworthy sources of information, cannot be over-estimated.

AMERICA.

The Outline of Cape Cod.—The latest volume (N.S. vol. xiii.) of the *Proceedings of the American Academy of Arts and Sciences* contains an essay by Prof. W. M. Davis, in which he reconstructs the original outline of Cape Cod by reversing the processes at work on the present outline. He endeavours to trace these processes, and the changes that they have produced, backward to their beginning. A review of previous accounts of the cape is given, a general consideration of the development of seashores is outlined, and the conclusions reached are applied to the problem under consideration. It is thus estimated that the land here once extended at most two or more miles into the sea on the east, and that perhaps three or four thousand years have been required for the retreat of the shore-line to its present position. This period cannot, however, be taken as a full measure of the time since the glacial deposits of the cape were formed, for there is reason to believe that the land stood higher than it is now for an unknown interval between the building of the cape and the assumption of its present altitude with respect to sea-level. The chief interest in the problem discussed turns on the growth of the great sand-spit of the "Provincelands" northward from the "mainland" of the cape, and on the protection thus afforded to the old cliffs of High head. A brief account is given of the growth and waste of the Provincelands, and of the changes of the western shore-line. The essay closes with some practical suggestions regarding the protection of Provincetown harbour, and some speculations concerning the future change of the cape. The encroachment of the sea on the back of the cape is undoubtedly destined to continue until the Truro mainland is all consumed north of Orleans, the "elbow" of the banded arm, which at the present rate of recession will probably require eight or ten thousand years.

Documents relating to the Venezuela and British Guiana Boundary Question.—The courtesy of the Capuchin Fathers at Rome has enabled the Rev. Joseph Strickland, S.J., to publish a series of documents and maps from the archives of that order, which supplement the information given in the English Blue Books on the subject of the extent of territory occupied by the Capuchin missions in Guiana in the eighteenth century. Whilst the general conclusions to be derived

* 'Geography of Africa.' By Edward Heawood, M.A. - London: Macmillan & Co. 1896.

from the new documents merely confirm those already arrived at in the Blue Books, their publication is of value as throwing additional light on the details of the history of the missions, and on the general character of the Spanish colonization in Guiana at the period in question. Of the maps published, the most interesting is No. 3, which gives, by a dotted line, the Spanish view of the limits of the Dutch colony of Essequibo. It was drawn in about 1772 by Friar Carlos de Barcellona, and, although based on the information of men known to be little favourable to the territorial claims of the Dutch, gives to the latter the greater part of the basin of the Essequibo, the frontier cutting the Cuyuni at an almost equal distance from its source and from its mouth. As the line drawn on D'Anville's map may be taken to represent the extreme Dutch claim, Father Strickland points out that the tract between these two lines is the only part of the territory about which there can be any dispute from an historical point of view. In a brief summary of the question, he arrives at the conclusion that, while the ownership of parts of this intervening tract is historically clear—e.g. the Dutch unquestionably occupied the whole coast strip between the Orinoco and the Essequibo—there are other parts about which little or nothing can be said from the evidence available.

The Peruvian Territory in the Amazon Basin.—Dr. Sievers contributes to the February number of *Petermanns Mittheilungen* an abstract of a paper on this region read before the Geographical Society of Lima by the prefect of the departments of Loreto and Amazonas. According to it, Iquitos had, in 1893, a population of 5000; Nauta, 500. The latter place is gradually recovering its lost trade. On the Ucayali there are no towns or villages. The inhabitants, about 20,000 in number, live in scattered families on the banks of the river. The mission settlements, even Sarayden, have disappeared. On the Amazon above the mouth of the Huallaga, Barranquitas has a population of about 200 Indians, engaged in collecting indiarubber. San Antonio is only a trading factory. On the Huallaga, Yurimaguas, the principal trading centre after Iquitos, seat of a sub-prefect, and in the neighbourhood of the richest cattle-pastures, has a population of like number. Moyobamba, with a population of 7000, engaged in the cultivation of coffee, and to a less extent cacao and sugar-cane, lies in a spot quite inaccessible to men on horseback. Tarampo has 6000 inhabitants, chiefly devoted to the cultivation of tobacco. The population of the region is composed of three sections—natives who live a wandering life in the forests, and who exchange boats, young slaves, indiarubber, and opium for firearms, agricultural implements, and spirits; settled Christianized natives; and people of mixed Spanish or other foreign and native Indian origin. The ruling class consciously or unconsciously plunder the natives, and render them completely subject. With the help of the wandering Indians, a path, used chiefly by indiarubber collectors, has been made between the sources of the Rio Tigre and those of the Pastaza. The cacao tree is found growing in immense quantity, especially on the banks of the Rio Cahuapana, and it is doubtful whether these are indigenous thickets or deserted plantations. Indiarubber trees grow in enormous numbers on the river-banks, and get rapidly replaced when destroyed; but the author believes that better results would be obtained from a rational plantation system than from the present wasteful method of getting the sap from trees growing wild. Steamers take eighteen days to ascend from Pará to Borja, on the Pongo de Manseriche.

The Region round the Headwaters of the Xingú.—The expedition to this region under Dr. Hermann Meyer has proved completely successful, so that the geographical and ethnographical exploration of this river may now be considered as completed in its main points. On his first Xingú expedition Dr. v. d. Steinen had discovered and ascended the middle headwater, the Batovy, and he

intended to explore the two others, the Kuluene to the east, and the Ronuro to the west, in his second expedition. Through the ignorance of his guide, however, the expedition was led to a western tributary of the Kuluene, called the Kulimut. This was explored along with the lower Kuluene, but want of time and provisions prevented the completion of the entire programme. This is what has now been done by Dr. Meyer. On May 11, 1896, he and his companion, Dr. Ranke, started from Cuyabá, and, following with few deviations the route of the first Xingú expedition, reached the Parantinga, one of the higher tributaries of the Tapajós, and descended it for a certain distance. The expedition then turned east, and after a three weeks' land journey reached the Ronuro, the western headwater of the Xingú, and ascended and descended it to the confluence with the Batovy, and that with the Kuluene, and made a survey of its course. The Kuluene was now attempted, but its rapid current compelled them to abandon the boat journey; but the whole district between the Kuliseu and the Kuluene was explored during a three weeks' march. The Kuluene proved to be much less important than the Ronuro, which latter is accordingly regarded by the travellers as the true source of the Xingú. The expedition reached Cuyabá again in December, with rich ethnographical and natural history collections and careful topographical surveys.—*Petermann's Mittheilungen*, February, 1897.

The Bolivian Rubber Industry.—A useful summary of the history and present prospects of the Bolivian rubber industry has been published in pamphlet form by Manuel V. Ballisvian, of La Paz, being a reprint of articles which originally appeared in the journal *El Telégrafo*. As the writer held an official position in the mission sent by the Bolivian government to the north-east territories and the department of Beni, in which the industry is carried on, he is entitled to speak with authority on the subject. He first traces the development of the rubber trade from its small beginnings during the palmy days of the export of chinchona, when the voyages of the bark-collectors into Brazil for the disposal of that commodity first called their attention to the flourishing rubber industry of the Brazilian provinces. This was in about 1863, when the first serious attempt at rubber exploitation in Bolivia was made by Don Santos Mercado, but for some years little success was attained, owing to the superior advantages possessed by the Brazilians, which led to an exodus of population from the Beni into the rubber forests of Brazil. The great impetus to the Bolivian industry was given by the explorations of Dr. Edwin Heath (*Proceedings R.G.S.*, 1883, No. 6) in 1880, which threw open a wider area of rubber-producing country, and led to a rush to the Beni, comparable to that to the Californian goldfields. One of the most enterprising pioneers was Dr. Antonio Vaca Díez, whose writings, together with the information collected by the above-mentioned Don Santos Mercado, have furnished some of the most reliable details on the subject. At the present day, the chief hindrances to the development of the industry arise, firstly, from a want of sufficient organisation in the work of collecting the rubber, the population being scanty, and the means of subsistence inadequately provided; and, secondly, from the obstacles to navigation, which make transport difficult. Both these points have received the attention of the Bolivian government, and the road past the cataracts of the Madeira, which has taken the place of the old railway project, was, in 1896, approaching completion. The second part of the pamphlet gives details respecting the mode of collecting the rubber, and statistics of the present state of the industry.

Volcanoes of Salvador and South Eastern Guatemala.—To the January number of *Petermann's Mittheilungen* Dr. K. Sapper contributes an account of the results of his observations in this region in the beginning of 1895, accompanying

his account with a map. These observations he regards as only preliminary, for he hopes to continue his studies in future years; but he considers that the journey he has already made is sufficient to make it clear that the volcanic phenomena of the region in question are much less simple than they have hitherto been thought to be. He points out that, while it is established that the main fissure to which recent volcanoes of Central America belong runs through Salvador (as well as Guatemala) in a direction nearly parallel to the Pacific coast, there is a considerable number of recent volcanoes in Salvador and South-Eastern Guatemala which do not belong to this fissure, being well-preserved simple cones, and in that respect different from the other primary volcanoes not belonging to the main fissure, which have been extensively worn away, and belong accordingly to a period geologically remote.

AUSTRALASIA AND OCEANIC ISLANDS.

Sir William Macgregor's Journey across New Guinea.—We have received a copy of the official report of Sir W. Macgregor, dated "Port Moresby, November 2, 1896," which contains the account of his recent journey across New Guinea from the mouth of the Mambare to that of the Yanago. It acquires additional interest as giving information respecting the gold-mining operations in the upper Mambare district, the cause of the recent massacre by the natives. The Lieutenant-Governor had been preceded in his ascent of the Mambare by the miners, the most enterprising of whom, Mr. Simpson, had cut a good road, with great labour and difficulty, on the north side of the river as far as the junction of its two main branches at the foot of Mount Scratchley. The start was made from Mambare bay on August 5, in two boats towed by a small steam-launch. The river was unusually low at the time, and navigation was difficult in places. After reaching the government station on the Mambare, the journey was continued by land through thick forest, three large tributaries of the main stream being passed. On March 14 "Simpson's Store" on Mount Otovia was reached, 1500 to 1600 feet above the river. Mount Otovia is the Mount Gillies of Sir W. Macgregor's former map (*Proceedings*, 1890, p. 256), the native name for Mount Parkes being Ajulakujula. The neighbourhood of these mountains, between which the Mambare flows in a deep narrow bed, is exceedingly moist, the trunks of the trees being covered with moss everywhere over 1000 feet, whereas on the Owen Stanley range it is only met with at 5000 to 6000 feet. Game is hardly found at all, and there are no traces of clearings or of native occupation of any kind. The two head streams of the Mambare, the Odirima and Yodda, are separated by the great mass of Mount Scratchley, the Yodda, which is much the larger, coming from the east and south of the mountain. Several miners were found still at work at the foot of Mount Scratchley, but work was about to cease on account of the rains. On the west side of the northern spur of the mountain is the village of Neneba, the chief of whom had visited the north coast, and was returning with Sir W. Macgregor. Numerous details are given with respect to the physical characteristics and habits of the people of Neneba, which are especially interesting on account of the great isolation in which they appear to live. Their colour is a dark bronze, and their hair is without exception frizzled. They showed themselves amiable and peaceable, and the state of their arms indicated that they had not been engaged in any warlike undertaking for years. The route led up to the ridge of Mount Scratchley, a road having to be cut the whole way. The rain, which had begun earlier on the lower grounds, gradually ascended to the higher levels, reaching the highest summits last of all. The highest part of Mount Scratchley, as of the other high peaks, consists of grassy country, broken by bare rocks and clumps

of trees. The highest peak reaches a height of about 12,550 feet. Sir W. Macgregor thinks that this mountain-top would be a good centre for prospecting operations. It is connected with Mount Albert Edward to the north-west (13,100 feet) by a high range (named Wharton chain by the explorers), and an easy road leads also to the Owen Stanley range. This was the direction taken by the travellers. Mount Victoria was ascended (the party suffering severely from cold), and the route thence to the coast did not deviate to any great extent from that followed in 1859, the old track still existing in places. The natives were most friendly. Latitudes were taken throughout the journey by astronomical observations, and the place of longitudes was supplied by accurate bearings of Mount Victoria and other peaks. Sir W. Macgregor insists on the importance, at least from a surveyor's point of view, of the use of a distinguishing name for the highest summit of the Owen Stanley range.

Mr. Collingridge on the Discovery of Australia.—Mr. George Collingridge, who for some years has given his attention to the subject of the discovery of Australia, has published a volume in which he brings together the results of his investigations, largely concerned with the evidence supplied by early maps. The fact of his residence in Australia, with few facilities for consulting original records, has placed him somewhat at a disadvantage, and many of the facts recorded are derived from previously published works on historical geography. But as the difficult subject of Australian discovery has never been exhaustively treated, and much new material has been collected since Mr. R. H. Major published his collection of documents for the Hakluyt Society, the mere bringing together from various sources of so large a body of facts will be of use to those interested in the subject. The text is accompanied by numerous copies of early maps by Mr. Collingridge's own hand, and, though wanting the exactness of photographic reproductions, they are apparently faithful representations both of the style and subject-matter of the originals. The conclusions arrived at by the author are in many cases little likely to meet with general acceptance. Without formulating any distinct theory, the general tenor of the book is to suggest that Australia was known to the rest of the world at a much earlier date than has been supposed. The old belief that the circumfluent ocean occupied the equatorial regions, may account, Mr. Collingridge thinks, for portions of the southern hemisphere being wrongly drawn by the ancient geographers north of the equator. He holds that Marco Polo's name "Java Major," applied to the modern Java as distinguished from Samatra (Java Minor), indicates that the Venetian traveller was aware of the existence of a vast land in those regions. He states that in the time of Nicolo de Conti the western coasts of Australia were known, though without supporting the statement by argument. And when dealing with the class of maps of which Balaam's globe is one of the best known examples, he deduces a knowledge of the west coast of Australia from the exaggerated southward extension of the Malay peninsula, which happens to fall within the latitudes really occupied by Australia. The numerous representations of a great southern continent in maps subsequent to Magellan's voyage, with their enigmatical legends "*Regio Patalis*," "*Pañtacorom terra*," etc., are of course dealt with, and a statement of one of them (the Paris wooden globe of about 1535) is adduced as indicating a southern discovery in 1499. With regard to the "Dauphin" map and others of its class, from which the probability of a Portuguese discovery of Australia early in the sixteenth century has been deduced, Mr. Collingridge claims to have proved conclusively, from a study of their nomenclature,

* "*The Discovery of Australia*." By George Collingridge. Sydney: Hayes & Brothers. 1895.

that they are of Portuguese and Spanish origin. He explains the northward extension of Australia on these maps by a desire, for purposes of policy, to represent the seaway as blocked by land in those parts, and quotes a statement of Barros in support of this theory. Perhaps the most useful feature in the book is the facility which it gives for tracing the course of evolution of early maps, although the author's conclusions in this respect too will not always be accepted by the reader.

GENERAL.

Wagner's Geographical Year-book.—The nineteenth volume of this standard work has been published. Following the usual custom, only a portion of the departments into which the survey of geography is divided is dealt with each year. The present issue includes a list of the latitude, longitude, and height above sea-level of 237 astronomical observatories brought together by A. Auwers, and reports of the progress of geography in the department of cartography by Prof. E. Hammer, plant-distribution by Prof. O. Drude, and ethnological research by Prof. G. Gerland. The recent works on the geography of Europe are dealt with by different authorities, the British Isles being reported on by Dr. H. G. Schlichter, but that of Russia is relegated to the next volume. Dr. E. Oberhummer gives a report on the progress of our knowledge of the geography of the ancient world, and Dr. Wolkenhauer contributes a geographical necrology for the years 1893-1895. Prof. Wagner gives a list of professorial chairs of geography, Hauptmann Kollm has compiled a list of geographical societies and serials, while a series of map-indexes of the official surveys shows the present state of publication of the official maps of Europe and India. From the information given, it appears that there are 150 professors or lecturers on geography in 95 universities or colleges, as compared with 126 and 82 in 1891. The greatest progress made during the five years has been in Russia, where geographical professorships have been created in the universities of Kief, Moscow, and Odessa; and in Switzerland, where professors have been elected in the universities of Freiburg, Neuchatel, and Zürich. The list of geographical societies has been corrected by the omission of some purely commercial or political associations formerly included, the deletion of a few that have ceased to exist, and the addition of some new ones. The total number in 1896 was 107 societies, with 38 branches, shared by 22 countries, and situated in 137 towns. The French geographical societies had, together, 16,500 members, the British over 5000, and the German over 6000; the greatest membership is that of the Royal Geographical Society, the Paris Geographical Society coming next with 2000 members. The number of geographical serial publications in 1896 was 153, of which 125 were published by societies. With regard to language, 48 of these are printed in French, 42 in German, and only 15 in English.

The Twelfth German Geographical Congress.—The details of this Congress, which will meet at Jena, as previously announced, in Easter week, have now been arranged. At the first meeting on Wednesday, April 21, Dr. Neunmayer will present his report on Antarctic exploration, and papers will be read upon travels in Brazil and Asia-Minor. The afternoon will be devoted to considering the question of geography in schools. On April 22, geophysics, especially the study of earthquakes, will be discussed. On April 23, biological geography, and the report of the committee for the scientific geographical description of Germany, will occupy the time of the meeting. Social gatherings will take place each evening, and geographical excursions to Weimar and also to the Saalthal have been arranged.

A Journal of School Geography.—Mr. Richard E. Dodge, of New York, has commenced with January, 1897, the publication of a new geographical serial of

unpretentious appearance, but of considerable promise. It is entitled *The Journal of School Geography*, and in its preparation the editor is associated with Prof. W. M. Davis and other practical geographers and teachers. Its aim is to advance the cause of good geography-teaching in schools; in order to do this, special care is to be devoted to the testing of all information before publication, and to the avoidance of "circumlocutions and flowery language." The new journal is stated to be independent of all schools of geography, institutions of learning, and publishers. It should thus be able to perform very important functions in directing the attention of teachers to books and maps which are of real value. The first two numbers show that the editors are able to give effect to their principles. The articles are all short, practical, and to the point; the book notices are critical and impartial; and the notes are well selected, although not free from misprints. These are not, perhaps, very serious, and will doubtless become rarer as time goes on. "The British Steamer *Penguin*" stands for "H.M.S. *Penguin*;" Dr. Nansen's Christian name is spelt *Fridthof*, the *London Geographical Journal* is referred to, and some of the transliterations of Russian names are defective. The new paper deserves success, and ought to be found useful by teachers outside the United States as well as inside. The subscription is only one dollar a year, and it is published at 41, North Queen Street, Lancaster, Pennsylvania.

Honours to Dr. Nansen.—The Honorary Degree of Doctor in Science was conferred on Dr. Nansen by the University of Cambridge on March 16. The following is the speech delivered by the Public Orator (Mr. J. E. Sandys) on the occasion: "*Scandinaviae filium Intrepidum, oceanum septentrionalia exploratorem ludescens, post tot pericula terra marisque per tres annos fortiter tolerata, saluum et aospitem reducem salutamus. Quid referam viri indomiti iuvenitatem primam, disciplinam severam, assidue exercitam, et rerum naturae studiis feliciter dedicatam? Quid itinera per priora animi et corporis patientiam et fortitudinem spectatam probatamque? Quid itinera in ultimo, adiutoris optimi auxilio, tot observationes sive magneticas sive meteorologicas e regione prius ignota reportatas? Quid dicam, an bene omnium nominis nave illa, quae glaciæ solidæ in mediis molibus, velut Symplegadium notarum in amplexu, constricta et compressa, ductoris tamen providi vota non fecerit, sed, mobili in glaciæ immobilis inhaerens, ad ulteriora sensim delata est? Navem illam, navisque rectorem, ipsum Vergilium prædixisse crediderim:—*

*'alter erit tum Tiphys et altera quæ velat Argo
deflectos herosa.'*

Quis autem pro rei dignitate laudare poterit par nobilis illud comitum, qui, nave ipsa relicta, glaciæ asperitibus per solitudines immensas audacter progressi, in regionem tandem pertraxerunt orbis terrarum vertici septentrionali proximam, quo ex ipsa mundi origine nulla hominum vestigia prius unquam penetraverant? Etiam arctici pelagi tum demum patefacti de navis primo Horatii verba licet usurpare:

*'illi robur et me triplex
circa portus erant qui fragillum truci
commisit pelago ratem.'*

Tantum virorum exemplo admoniti discimus nihil magnam, nihil memorabile, nisi labore longo curaque lapsula posse perfici. Taliū virorum in orbe terrarum explorando providentia et fortitudine verba poetæ Romani futura vaticinantia denique vera reddita sunt:—

*'venient anna emula seris
quibus oceanus vincula rerum
laxet et ingens pateat tellus,
Tethyæque novæ delegat arbes
nec est terra ultima Thule.'*

Duce ad vos FRIEDRICH NANSSEN." On March 18, the Honorary Degree of D.C.L. was conferred on Dr. Nansen by the University of Oxford. On that occasion the Regius Professor of Civil Law (Dr. Goudy) presented Dr. Nansen to the Vice-Chancellor in the following speech: "Insignissimus Vice-Cancellario, vosque egregii Procuratores! Prasento vobis virum egregium e gente Septentrionali oriundum, tantam ipsam impavidum. Procipua vero voluptate consalutare libet ejus generis alumnum quod olim, 'si prima domus repetatur origo,' felicissimo quodam federe patriam nostram, oceanum potentem, progenie sua ditaverit. Hic vir, juvenili adhuc aetate, per terram illam cui nomen est Greenland—terram vero horrificam qua nusquam diffugiant nives neque graminis ulla redeunt campis, qua 'semper hiems semper spirantes fulgora Caeri'—ab Oriente usque ad mare Occidentale, ingenti labore viam patefecit. Res praeclara ab illo nupertimo sub axe Boreo gesta quinam ex vobis ignorat, quis non admiratione prosequitur? Patrie ardore instigatus et scientiae amore rudem et adhuc intentatam Amphitritem imbuiere, monstris scatentem pontum irumpere, glacies, noctem illam longam et intempestivam, ignotas vias, tempestates, Jovem iniquum, animo instanti pertulit. De quo cum poeta licet dicere 'Solum Hyperboreas glacies, Tanaimque nivalem, Arraque Rhipaeis nusquam viduata pruina, Lustravit.' Modestis singulari, fidelitate in socios, constantia miri notus est; neque Fortuna audacia defuit. Idoneus igitur videtur illo atque adeo dignissimus qui rectis oculis splendores pallidos notis Septentrionalis aspexerit, qui Oceani Artici profundum tentaverit, jam ad has sapientiae sedes, periculorum expertem, accedere atque Isidis fontes more tranquillo haurire. Faxit Deus optimus maximus, cui terrae cui maria curae, ut nobiscum familiaritatis vinculo atroxissimo conjunctus regionum ignotarum se exploratorem assiduum probeat nostramque insulam, tanquam patriam alteram, habere dignetur, unde fructus pulcherrimi ad ipsius simul nostramque gloriam redundant. Hunc igitur prasento

FRIEDRICH NANSSEN

philosophiae doctorem, necnon Inter Cantabrigienses scientiarum doctorem honoris causa nominatum, necnon Societatis Regiae Geographicae laurea ornatum, ut admittatur ad gradum doctoris in jure civili honoris causa."

OBITUARY.

Sir Thomas Elder, G.C.M.G.

EARLY in March a telegram from Adelaide announced the death of Sir Thomas Elder, the munificent patron of Australian exploration, who, though not himself an explorer, has within the last thirty years done more, perhaps, than any one man to reduce the blank spaces on the map of Australia. The son of Mr. George Elder, of Kirkcaldy, Fifeshire, Sir Thomas Elder was born in 1818. In 1854 he emigrated to South Australia, which thenceforward became his home, although in 1890 he paid a lengthened visit to his native Scotland. Devoting himself to mercantile pursuits, he became in time the senior partner of the firm of Elder, Smith and Co., wool and stock agents, of London and Adelaide. In 1863-68, and again in 1871-78, he was a member of the Legislative Council of South Australia; and in 1874 he contributed a munificent sum towards the endowment of the Adelaide University. He paid special attention to the introduction into the colony of improved breeds of

cattle, sheep, and horses, from which Australia as a whole has derived much benefit. One of his most important services to Australian exploration was the encouragement which he gave to the introduction of camels into that continent. Although these animals had already been used on exploring expeditions (e.g. that of Burke and Wills in 1860), the experiment had met with small success, until in 1861-66 Sir Thomas Elder imported a fresh supply, and a few years later proved their value to explorers during the expedition under Colonel Warburton, of which he was one of the promoters. The important journeys of Ernest Giles were also supported by Sir Thomas, and camels were again used with success. Finally, the great "Elder Exploring Expedition" was fitted out by him in 1891, with a view to removing from the maps the last blank space of any importance on the Australian continent, and although untoward events prevented the expedition from attaining the full measure of success which had been anticipated, it did good work in throwing new light on portions of the interior of West Australia. Sir Thomas Elder joined our Society in 1878. In the same year he received the honour of knighthood, and he became G.C.M.G. in 1887.

CORRESPONDENCE.

On the Formation of Sand-dunes.

IN the current month's number of the *Geographical Journal*, I observe that, during the discussion of an elaborate and instructive paper under the above heading, allusion is made to a "curious sound made by certain sandhills" in the desert north of the Helmand.

On referring to my diary of March 21, 1872, I find that my fellow employees in the Perso-Afghan Mission and I, returning from Sistan westwards, passed, on our march of that date, a hill called *Rig-i-Rawān*, or the "moving sand," where our Afghan friends performed *Zīyarat*, or rites of pilgrimage. Should you think the circumstance of the sounds there heard worth recalling, in connection with the recently read paper, it might be well to reprint Major Evan Smith's description given at pp. 327, 328 of 'Eastern Persia,' vol. I. (Macmillan: 1876).

"From Kain'h-i-Kāh to the Hānūz-Rūd there is a distance of 16 miles in a due westerly direction, and at the fifth mile the famous Zīrat of Luman Zāh is passed on the right of the road. This Zīrat, which is called the *Rig-i-Rawān*, or moving sand, is most remarkable and singular. At the extreme west of the range of hills which has been described as lying in a straight line due north of the Kāh-i-Kāh district, is a hill some 600 feet high and half a mile long. The southern face of this hill, to the very summit, is covered with a drift of fine and very deep sand, which has evidently been there for ages, as testified by the number of large plants growing on its surface. None of the adjacent hills have any traces whatever of sand-drift, and the surface of the surrounding desert is hard and pebbly. The westernmost portion of this elevated ground contains the Zīrat, and the natives say, and with reason and truth, that at times the hill gives out a strange startling noise, which they compare to the rolling of drums. Captain Lovett, who was fortunate enough to hear it, describes its effect upon him as like the wailing of an æolian harp, or the sound occasioned by the vibration of several telegraph wires—very fine at first, but increasing every moment in volume and intensity, and the secret strain is said sometimes to last as long as an hour at a time. The face of

the hill is concave, its cavity is filled with the sand, and underneath there appears to be a hard limestone surface. It would be useless, after a summary inspection, to hazard an opinion as to the cause of the remarkable sounds that proceed from the hill; but it is noticeable that they may be produced by any large number of men, at the top, putting the sand in motion. It should be remarked at the same time that the noise is often heard in perfectly still weather, and when nobody is near the hill; and it is singular, also, that the limit of the sand at the bottom seems never to be encroached upon by falling sand from the summit, though the face of the hill and sand-drift is very steep. On watching the sand this morning, at the time he heard the sound, Captain Lovett observed that its vibrations and the movements of the pilgrims who had gone to the summit of the drift, occurred at the same moment. The natives, of course, ascribe miraculous properties to the hill. It is believed to be the grave of the Imam Zâid, the grandson of Husein, the son of Ali. Tradition says that, being pursued by his enemies, he came to this hill for refuge, was covered one night by the miraculous sand-drift, and has never been seen again. They say that the sand, thus miraculously brought by heavenly aid, could be removed by no earthly power, and that were any one impious enough to try it, the sand would return of its own accord. They believe the hill, like the ancient oracles, to give out warning when anything important is going to happen in the district. Thus, in the time when the Törkumans used to make their forays as far south as this, the hill always gave warning the night before their arrival; and we are assured that the arrival of our mission was heralded by the same sounds. The head of the district told us that the noise could be heard in still weather at a distance of 10 miles; and Sâiyid Nûr Muhammed Shah declares he heard it distinctly last night at our camp 5 miles off. Shi'as and Sûnnis alike, unable to contend against the evidence of their ears, come to worship at this miraculous spot, and here find a common ground on which they can meet in amity. These Muhammedans do not generally subject themselves to so severe a trial of faith as that of visiting this particular *Ziârat-gâh*. It is a very steep climb for them to the commencement of the band of sand, about 200 feet broad and nearly perpendicular, and as they sink up to the thighs in this at every step, often must they regret that the Imam could not have hid himself in a more accessible spot. The tomb is situated at the top of the sand-ridge, and it is in their descent that the faithful are generally rewarded for the trouble they have voluntarily undergone by hearing the miraculous noise. Sardar Ahmad Khan, all his attendants, and a great number of stalwart Afghans went up the hill, and we observed that they were more than half an hour getting across the sand; our more effeminate Tehran servants did not seem to care to make the attempt. The base of the hill is surrounded by graves of the faithful, who, it is to be hoped, are not disturbed in their last sleep by the unearthly warnings of the object of their devotion. It is probable, after all, that science could give a very simple explanation of the phenomena; but he would be a bold man who tried to explain the same by natural causes within 100 miles of its influence." Another description of the *Hip-i-Ramân* will be found at p. 235 of Dr. Ballew's '*From the Indus to the Tigris*' (Tribner: 1874).

F. J. GORRISTON.

March 4, 1897.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1896-1897.

Seventh Ordinary Meeting, February 22, 1897.—Admiral W. J. L. WHARTON, C.B., F.R.S., Vice-President, in the Chair.

ELECTIONS.—*George Louis Alward; Colonel R. S. S. Baden-Powell, 13th Hussars; Victor Bryer; William Arthur Boord; James William Brooks; Lieut. James Blackburn Bedford; Hon. William E. Cavendish; Wilson Greenwood; John Ernest Cochrane; Charles Calaguly Collier; John Tulliot Clifton; John E. Champney; Andrew Drummond; Edward Davis; Peter Robert Denney; Harry Ellis; Viscount Ennoble; John Scott Fraser; William Henry Forbes; John Halliday; J. Fitzgerald Mahon; Commander Frederic R. W. Morgan, R.N.; Walter Mercer; J. Y. W. MacAllister; Daniel Nicholson; Hon. Seymour Omsby-Gove; Rev. Edward G. C. Parr; Claud Frederick Williams Russell; Arthur Henry Sharp; Captain Edward Mabbett Woodward, Leicester Regiment.*

The Paper read was:—

"The Southern Border of Afghanistan." By Captain A. H. McMahon. With
"Note on the Perso-Baluch Boundary." By Colonel T. H. Holdich, R.E., C.B.

Eighth Ordinary Meeting, March 8, 1897.—Admiral W. J. L. WHARTON, C.B., F.R.S., Vice-President, in the Chair.

ELECTIONS.—*Charles George Arthursnot; Henry Thomas Ashby; Alfred Powell Hutton; John Cordoux; J. Law Crawford; Captain The Hon. Ascelton Curzon-Ham, C.B., C.M.G., R.N.; Major Neil Douglas Finlay, R.A.; Thomas George Hobbs; Thomas Davies Jones; O. C. Macrae; Frederick William Marten; Richard Ponsonby Maxwell; Norman P. M. de Cordray Transon, late 10th Hussars; Ernest Dent Vaisey; Admiral Thomas Lett Ward.*

The Paper read was:—

"Recent Discoveries South of Hudson Bay." By Dr. Robert Bell, of the Canadian Survey.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., Librarian, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academia, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographia, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.

Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selakab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 x 6½.

EUROPE.

- Alps.** *Z. Deutsch. u. Österr. Alpenvereins* 27 (1896): 171-211. Blodig and Purtscheller.
Aus den Bergen der Maurienne und der Tarentaise. (Schluss zum Aufsatz in der "Zeitschrift" 1895.) Von Dr. Karl Blodig und L. Purtscheller. With Illustrations.
- Alps.** *Z. Deutsch. u. Österr. Alpenvereins* 27 (1896): 212-223. Enzensperger.
Die Höfats im Alpin. Von Joseph Enzensperger. With Map and Illustrations.
- Alps.** *Z. Deutsch. u. Österr. Alpenvereins* 27 (1896): 231-270. Becker.
Der Gurgler Kamm. Von Gustav Becker. With Map and Illustrations.
- Alps.** *Z. Deutsch. u. Österr. Alpenvereins* 27 (1896): 277-319. Schuster.
Die Langkofelgruppe. Von Oscar Schuster. With Illustrations.
- Alps.** *Z. Deutsch. u. Österr. Alpenvereins* 27 (1896): 320-351. Hess.
Wandertage in den Steiner Alpen. Von Heinrich Hess. With Illustrations.
- Alps.** *Z. Deutsch. u. Österr. Alpenvereins* 27 (1896): 140-170. Euringer.
Berg- und Gletscherfahrten in der Montblanc-Kette. Von Gustav Euringer. With Plate.
- Alps—Fluchthorn.** *Alpine J.* 18 (1897): 307-324. Coolidge.
The Fluchthorn and its Neighbours. By W. A. B. Coolidge.
- Austria—Bosnia.** *Rev. Française* 22 (1897): 87-95. Kotschet.
Les progrès de la Bosnie. Par le Dr. Kotschet.
- Austria—Bukowina.** *Aus allen Weltteilen* 23 (1897): 293-298. Kafadl.
Die Herkunft der Deutschen in der Bukowina. Von Professor Dr. Reinhard Friedrich Kafadl.
- Denmark.** *Institut Météorologique de Danemark. Annales de l'Observatoire Magnétique de Copenhague* publiées par Adam Paulsen. Années 1893-94. Livraison I. Copenhague: G.-E.-C. Gad, 1896. Size 13 x 8, pp. 50. Paulsen.
- France.** *Le Canal des Deux-Mers: Mémoire présenté au nom de M. Kerviler par M. Gallet, Congrès National des Sociétés Françaises de Géographie, 16^e Session, Bordeaux, Août 1895. Comptes Rendus. Bordeaux, 1895. Size 10 x 6½, pp. 208-225. Kerviler.*
On the proposed ship canal from the Gironde to the Mediterranean.
- France—Census.** *Rev. Française* 22 (1897): 96-103. Lasalle.
Le recensement Français de 1896 et ses conséquences. Par C. de Lasalle.
- France—The Loire.** *Ann. G.* 6 (1897): 43-69. Gallouédec.
La Loire navigable. Par M. L. Gallouédec.
- Holland.** *Tijds. R. Ned. Arch. Genoot. Amsterdam* (2) 13 (1896): 493-507. Hoekstra.
De bevolking van de groote middelpunten van bevolking in Nederland op 1 Januari 1890 en 1 Januari 1896. Door Dr. J. F. Hoekstra.
Comparison of the population of the principal towns in Holland at the censuses of 1890 and 1896.
- Hungary.** *Jekelfalussy.*
The Millennium of Hungary and its People. Issued under the authority of the Royal Hungarian Minister of Commerce, as President of the Millennial National Exhibition Commission. Edited by Dr. Joseph de Jekelfalussy. Budapest, 1897. Size 9½ x 6, pp. vi. and 672. Presented by the Author.
An account of the geography, history, and actual conditions of the Hungarian monarchy.

Iceland and Scandinavia.

Houette and Morasche.

Ann. Hydrographiques (2) (1896): 49-70.Mission magnétique en Islande et en Scandinavie (1895) de l'avis-transport La *Manche*. Par M. Houette et M. Morasche. *With Diagrams*.

The Bureau de Longitudes having undertaken the production of a map of magnetic conditions over the Earth from French sources for the great exhibition of 1900, the expedition described in this paper was one of those despatched for the purpose of completing observations of the three elements of terrestrial magnetic force.

Italy.

G.Z. 3 (1897): 1-14.

Hassert.

Die Abruzzo. Von Kurt Hassert.

Mediterranean—Karpethos.

Stefani, etc.

Karpethos. Etude géologique, paléontologique et botanique. Par le Professeur Carlo de Stefani, le Dكتور C. J. Forsyth Major et William Barbey. Avec treize planches par Ch. Guisot et deux planches en phototypie. Lausanne: G. Bridel & Co., 1895. Size 13 x 16, pp. 180. *Presented by Dr. C. J. Forsyth-Major*.

A monograph on the plants and palæontology of Karpethos, including a bibliography of the island by Dr. Forsyth-Major. The book contains no map.

Meuse river.

Mesurement G. 14 (1897): 73-76, 97-99.

Rutot.

Le cours de la Meuse à travers les âges géologiques d'après une communication faite par M. A. Rutot, à la Société belge de géologie. *With Maps*.

Monaco.

Deutsche Rundschau G. 19 (1897): 203-215.

March.

Die kleinsten Staaten der Erde. Eine geographische Plauderei. Von Richard March. *With Illustrations*.

Portugal—Oporto.

História da direcção da Associação Commercial do Porto no Anno de 1896 apresentado à Assembleia Geral, em Sessão de 18 de Janeiro de 1897. Porto, 1897. Size 9 x 6, pp. 170, and 232.

Russia—Riga.

Aus allen Weltteilen 26 (1897): 307-315.

Schnobert.

Riga. Ein deutsches Stadtbild. Von Karl Schnobert.

Russia—Rundö.

Globe 71 (1897): 191-197.

Biedensteln.

Eine Fahrt nach Rundö im Rigischen Meerbusen. Von Dr. A. Biedensteln. Hobben. *With Illustrations*.

Spain—Pyrenees.

Saint-Saud.

Note sur la cartographie des Pyrénées espagnoles en 1895. Par M. le comte d'Artois de Saint-Saud.—Congrès National des Sociétés Françaises de Géographie. 10^e Session. Bordeaux, Août 1895. Compte Rendu, Bordeaux, 1895. Size 10 x 6½, pp. 315-325.

Spain—Sierra Nevada.

B.S.G. Medrel 23 (1896): 177-206.

Marin.

La Sierra andaluz. *Crónica de una excursión a la Sierra Nevada*. Por Diego Marin.

Sweden—Meteorological Observations.

Observations météorologiques suédoises publiées par l'Académie Royale des Sciences de Suède, exécutées et rédigées sous la direction de l'Institut Central de Météorologie. Vol. 33, 2^eme série; vol. 12, 1891. Stockholm, 1895. Size 12½ x 10, pp. xiii, and 153.

United Kingdom—England. *P. Philosph.* 5. *Glasgow* 27 (1896): 57-69.

Lodge.

Why has England become a Great Manufacturing, Commercial, and Colonizing Country? By Richard Lodge, M.A.

This will be specially noticed.

United Kingdom—England—Yorkshire.

Baddelay.

Thorough Guide Series. Yorkshire (Part I.), the East Coast, York, and the country between the N.E. Main Line and the Sea, also the Cathedral and Castle of Durham (pp. xvi, and 136); (Part II.) West and part of North Ridings and all parts of the country west of the N.E. Main Line, also Barnard Castle and Teesdale. By M. J. B. Baddelay, M.A. Second Edition, revised. London: Dulau & Co., 1893. Size 8½ x 4½, pp. xvi, and 145. *Maps and Plans*. Price (two parts in one vol.) 3s. *Presented by the Publishers*.

United Kingdom—Ireland. *P.N. Irish A.* (3) 4 (1896): 74-111.

Browne.

The Ethnography of Ballyeroy, co. Mayo. By Charles R. Browne, M.D. *With Plates*.

- United Kingdom—Ireland.** *P.R. Irish A. (3) 4 (1896): 112-118.* **McArdle.**
 Additions to the Hepatica of the Hill of Howth, with a Table showing the Geographical Distribution of all the Species known to grow there. By David McArdle.
- United Kingdom—Ireland.** **Martel.**
 Îlands et Cavernes Anglaises. Par E.-A. Martel. Paris: C. Delagrave, 1897. Size 9 x 6, pp. 404. *Plans and Illustrations. Presented by the Author.*
 M. Martel writes this book, he says, partly to describe his underground campaign in the caves of England and Ireland, and partly to give expression to his admiration of the natural beauties of Ireland. The work is admirably done, and the illustrations reveal scenery of a kind which few in this country had previously seen.
- United Kingdom—Ireland.** *P.R. Irish A. (3) 4 (1896): 30-34.* **Fraeger.**
 Report upon the Raised Beaches of the North-East of Ireland, with special reference to their Pama. By R. Lloyd Fraeger. *With Plate.*
- United Kingdom—Ireland.** *P.R. Irish A. (3) 4 (1896): 55-60.* **Westropp.**
 Magh Adhair, co. Clara, the Place of Inauguration of the Dallesian Kings. By Thomas Johnson Westropp, R.A. *With Plate.*
- United Kingdom—Scotland.** **Morris.**
 The Raised Beaches of the Forth Valley. By David B. Morris, Stirling. Read to the Stirling Natural History and Archaeological Society, November 15, 1892. (Reprinted from the *Stirling Journal and Advertiser*, 1892.) Size 7½ x 5, pp. 34.
 The Glaciation of the Forth Valley. By David B. Morris, Stirling. Read to the Stirling Natural History and Archaeological Society, February 26, 1894. (Reprinted from the *Stirling Journal and Advertiser*, 1894.) Size 7½ x 5, pp. 18.
 The Travelled Boulders of the Forth Valley. By David B. Morris, Stirling. Read to the Stirling Natural History and Archaeological Society, November 10, 1895. (Reprinted from the *Stirling Journal and Advertiser*, 1896.) Size 7½ x 5, pp. 18. *Presented by the Author.*

ASIA.

- Annam.** *Splunden 2 (1896): 125-132.* **Dégoutin.**
 Les Grottes de marbre de Tourane (Annam). Par M. Dégoutin. *With Illustrations.*
- Arabia.** **Hirsch.**
 See Hirsch. Reisen in Süd-Arabien, Mehra-Land und Hadramut. London: E. J. Brill, 1897. Size 10 x 6½, pp. xii, and 332. *Map and Plates. Price 6s.*
- Asia-Minor—Phrygia.** **Ramsay.**
 The Cities and Bishoprics of Phrygia, being an Essay of the Local History of Phrygia from the Earliest Times to the Turkish Conquest. By W. M. Ramsay, M.A., F.R.S. Vol. I, Part B West and West-Central Phrygia. Oxford: The Clarendon Press, 1897. Size 10 x 7, pp. xvi, and 358-792. *Price 21s. Presented by the Delegates of the Clarendon Press.*
 This important work will be noticed in the Journal.
- Central Asia—Pamirs.** **Poncinus.**
 Chasses et Explorations dans la Région des Pamirs. Par le Vicomte Edmond de Poncinus. Paris: A. Challancet, 1897. Size 10 x 6½, pp. 260. *Map and Illustrations. Presented by the Author.*
 A well-illustrated account of M. de Poncinus' sporting expedition in the Pamirs.
- China.** **Ehlers.**
 Im Osten Asiens. Von Otto E. Ehlers. Dritte Auflage. Berlin: Allgemeiner Verein für Deutsche Literatur, 1896. Size 9 x 6½, pp. viii, and 392. *Maps and Illustrations. Price 6s.*
 This book describes visits to Hongkong, Manco, Canton, various journeys in the interior of China, including a trip into Mongolia, and the narrative of a month's residence in Korea.
- China—Mongolia.** *P.R. Artillery I. 24 (1897): 49-50.* **Burrard.**
 A two months' trip into Mongolia. By Lieut. C. S. Burrard.
- Eastern Asia.** *Contemporary Rec. 71 (1897): 153-171.* **Norman.**
 Russia and England: "Down the Long Avenue." By Henry Norman. *With Map.*
 Treats of the new Manchurian railway.

India.

Chattopadhyaya.

Descriptive Geography of India, with a Detailed Account of Bengal for the use of Schools and Pathshalas. Compiled by Sâsi Bhûsan Chattopadhyaya. Twentieth Edition. [In Bengali.] Calcutta: B. L. Chakravarti, 1903. Size 7 x 4½. Maps. Presented by the Author.

India.

J.R. Arts 45 (1897): 161-178.

Lee-Warner.

Moral Advance of the Peoples of India during the Reign of Queen Victoria. By William Lee-Warner, M.A., F.R.S.

India.

Ca 1a.

Quarto Centenario do Descobrimento da India. Contribuições da Sociedade de Geographia de Lisboa. A Viagem da India. Poemeto em dois cantos. Por Fernandes Costa. Lisbon: Imp. Nacional, 1896. Size 10 x 6½, pp. 42.

India—Madras.

Report of the Condition and Progress of the G. V. Juggarow Observatory, Vizagapatam. Including the Results of Observations for the year 1895. Published by the General Committee, G. V. Juggarow Observatory, Vizagapatam. Calcutta, 1896. Size 9½ x 6½, pp. 50.

India—Wrecks.

Creagh.

Return of Wrecks and Casualties in Indian Waters for the year 1895, together with a Chart showing the positions in which they occurred, and a Diagram showing comparative number of the reported maritime casualties, etc., the total tonnage, and the number of lives lost, for the past twenty years. Prepared by B. P. Creagh, Commander R.N. Calcutta, 1896. Size 13½ x 8½, pp. 60.

Japan.

Siebold.

Nippon, Archiv zur Beschreibung von Japan und dessen Neben- und Schutzländern Jesso mit den südlichen Kurilen, Sachalin, Korea und den Liuku-Inseln. Von Ph. Fr. von Siebold. Herausgegeben von seinen Söhnen. Erster Band. Zweite Auflage. Würzburg und Leipzig: Leo Woebl, 1897. Size 11 x 7½, pp. xxxvi and 422. Map and Illustrations. Price 15s.

This re-publication of the standard work describing the state of Japan in the second quarter of the present century, before its opening to European influence, is appropriately prefaced by a short biography of the author.

Japan—Earthquake.

Quarterly J. Geol., 8, 53 (1897): 1-15.

Davison.

On the Distribution in Space of the Accessory Shocks of the Great Japanese Earthquake of 1891. By Charles Davison, sc.d. With Illustrations.

Japan—Earthquake at Sâk.

Petermanns M. 43 (1897): 31-37.

Rein.

Das Seebeben von Kânaijahi am 15 Juni 1896. Von Prof. Dr. J. Rein. With Map.

Japan—Formosa.

M.G. Ges. (für Thüringen) Jan 13 (1897): 1-21.

Mackay.

Unter den Aboriginalstämmen Formosae. Von Missionar Dr. th. G. L. Mackay in Tamsui.

Japan—Formosa.

B.S.G. Madrid 38 (1896): 210-277.

Mencarini.

Formosa. Apuntes para un estudio. Por Dr. Juan Mencarini.

Japan—Kiusiu.

B.S.G. Comm. Harv 13 (1896): 185-212.

Lièvre.

Une éruption volcanique au Japon. Par M. D. Lièvre. With Maps and Illustrations.

An account of the eruption of Higashi Kirishima in Kiusiu which occurred on March 15, 1893, at the moment when the author was on the edge of the crater. His guide was killed, and he himself barely escaped with his life. The description of the actual eruption is very graphic.

Japan—Kuril Islands.

Snow.

Notes on the Kuril Islands. By Captain H. J. Snow. London: John Murray, 1897. Size 8½ x 6, pp. 92. Charts. Price to Fellows of the Society, 2s.; to non-Fellows, 4s.

Captain H. J. Snow embodies in this little volume (which is one of the extra publications of the R.G.S.) a vast amount of personal observation on the little-known group of the Kuril Islands. The charts are of very great value. They show the correct positions of many of the islands for the first time, and also contain the position of many harbours, rocks, shoals, tide-rips, etc., which had not previously been charted. Prof. John Milne concludes a brief prefatory note thus: "In short, after shipwrecks, risks, and dangers, the escapes from which have often seemed incredible, independently

of the geological, natural history, and general scientific notes which have been collected, Captain H. J. Snow, whilst sacrificing by his publications his own professional interests as a hunter, has entitled himself to recognition from all who navigate and patrol the fog-bound shores of the rocky Kurils."

Kafiristan. *Blackwood's Mag.* 161 (1897): 359-366.

Broadfoot.

Kafiristan and the Kafirs. By Major W. Broadfoot.

This article gives references to the main sources of information regarding Kafiristan from the earliest legends down to Sir George Robertson's book.

Kafiristan.

Robertson.

The Kafirs of the Hindu-Kush. By Sir George Scott Robertson, K.C.B., British Agent, Gilgit. Illustrated by A. D. McCormick. London: Lawrence & Bullen, 1896. Size 10 x 7, pp. xx. and 658. *Map and Illustrations.* Price 31s. 6d.

A note on this book appeared in the *March Journal*, vol. ix, p. 329.

Malay Archipelago—Bali and Lombok.

Carpenter.

J. R. G. S. Australasia (Sydney) 6 (1896): 43-71.

Islands of Bali and Lombok, Malay Archipelago. By Captain J. B. Carpenter.

Descriptions of the islands, with special reference to the manners and customs of the people. The author is personally acquainted with all the islands of the Malay Archipelago, and his article is consequently valuable.

Malay Archipelago—Bornéo. *Rev. G.* 40 (1897): 117-123.

d'Estrey.

Sambur, Division occidentale de Bornéo. Exploitation des mines d'or. Cultures.

Par le Dr. H. Meynere d'Estrey.

Malay Archipelago—Celebes.

Kruijt.

M. G. Ges. (für Thüringen) Jena 16 (1897): 41-56.

Beiträge zur Volkskunde der Poso-Alfuren. Von Missionar A. C. Kruijt in Poso (Celebes).

Malay Archipelago—Celebes.

Sarasin.

A travers le Monde, Tour du Monde (n.s.) 3 (1897): 41-44.

Le Voyage de M. Sarasin à Célèbes. With Map and Illustrations.

Malay Archipelago—Ceram.

Hoëvell.

Tijds. K. Ned. Aard. Genoot. Amsterdam (2) 13 (1895): 508-532.

Bijdrift bij de Kaarten van Seran (vulgo Ceram). Door G. W. W. O. baron Van Hoëvell. With Map.

Malay Archipelago—Java.

G. Z. 3 (1897): 79-88.

Kroncker.

Einiges über die Ursachen und die Verbreitung der Malaria auf der Insel Java. Eine tropenhygienische Studie. Von Dr. med. Franz Kroncker.

Russia—Caucasus.

Hahn.

Kaukasische Reisen und Studien. Neue Beiträge zur Kenntnis des kaukasischen Landes. Von C. Hahn. Leipzig: Duncker & Humblot, 1896. Size 3 x 6, pp. 360. Price 6s.

A special note will be given on this book.

Russia—Transcaspien.

Petersburger M. 43 (1897): 25-34.

Andrussow.

Der Ailschi-darja- oder Karabugsa-Becken. Von Prof. Nik. Andrussow. With Map.

Turkey—Babylon.

Norsk. G. Selsk. Aarb. 7 (1896): 1-16.

Sundberg.

Babylonien af Dr. med. John C. Sundberg. With Illustrations.

AFRICA.

British East Africa—Uganda. *J. Manchester G. S.* 12 (1896): 63-73.

Smith.

Uganda. By the Rev. F. C. Smith, M.A.

British South and East Africa.

Lucas.

A Historical Geography of the British Colonies. By C. P. Lucas, M.A. Vol. iv. South and East Africa. Part I. Historical (pp. 330); part ii. Geographical. Oxford: The Clarendon Press, 1897. Size 8 x 5, pp. 156. *Maps. Price.* Part I, 6s. 6d.; Part II, 5s. 6d. *Presented by the Delegates of the Press.*

This volume is published in two parts—the first mainly historical, the second mainly geographical. They deal in the graceful and thorough manner characteristic of the work of Mr. Lucas with the chain of events which led to the acquisition and development of the South and East African possessions of the British Crown. A

thoroughly impartial standpoint is occupied throughout. The maps, although in the same style which proved satisfactory for the small and rarely mapped island-colonies treated of in earlier volumes, appear rough and poor when compared with the fine large-scale maps of South Africa to which the public has grown accustomed.

Congo State. *Mouvement G. 14* (1897): 61-63.

Le pays des Wanfumu entre le Pool, le Kussai et le Kwango. With Map.

Congo State.

Observations sur la géologie du Congo occidental. Par J. Cornet. (Extrait du Bulletin de la Société Belge de Géologie, de Paléontologie et d'Hydrologie. Bruxelles.) 1896. Size 10 x 9½, pp. 18. Presented by the Author. Cornet.

Congo State. *U.S. Studies colon.* 3 (1896): 187-250.

Fourbaix.

Le Commerce de l'État indépendant du Congo. Par V. Fourbaix.

Congo State.

Mouvement G. 14 (1897): 49-53.

Romana.

La mission Vercepsy au lac Albert-Édouard et dans le bassin de l'Arwind. Par B. de Romana. With Illustration.

Congo State.

Norsk G. Selsk. Aarb. 7 (1896): 46-72.

Scharffenberg.

Congo af Ingeniør Johannes Scharffenberg.

Congo State—Lomani. *Mouvement G. 13* (1896): 421-424.

Wauters.

Le Lomani. Par A.-J. Wauters. With Map.

Egypt—Sudan.

Knight.

Letters from the Sudan. By the Special Correspondent of the Times (E. F. Knight). Reprinted from the Times of April to October, 1896. London: Macmillan & Co., 1897. Size 9½ x 6, pp. 323. Maps and Illustrations. Price 8s. 6d. With. Presented by the Publishers.

These letters are illustrated by several clear maps and plans and some excellent pictures. They describe the whole course of the last Sudan expedition, from the departure from Assuan to the capture of Dongola.

Egypt—Upper Nile. *Ann. G. 3* (1896): 506-521; 3 (1897): 61-70.

Martonne.

La vie des peuples du Haut-Nil. Explication de trois cartes anthropogéographiques. Par M. E. de Martonne. With Maps.

French West Africa.

A travers le Monde, Tour du Monde (n.s.) 2 (1896): 321-324.

Alleman.

Souvenirs du Cayor. Par M. Emile Alleman. With Illustrations. Cayor is situated between Senegal and Cape Verde.

Madagascar.

M.G. Ges. (für Thüringen) Jena 15 (1897): 21-41.

Nilson-Lund.

Reisen norwegischer Missionare in Madagaskar. Von G. Kurze. III. Missionar P. Nilson-Lund's Reise durch das südliche Mensebe.

Sahara.

Foucault.

Ferdinand Foucault. Au Sahara. Mes deux missions de 1892 et 1893. Le Gassi Touil et le Grand Erg, l'Oudjo and et le Tighart, Hassi Messaghem et Hassi Imoulay. Rédaction du Rapport de Mission publié en juillet 1896. Paris: A. Challamel, 1897. Size 10 x 6½, pp. 102. Map. Price 3s. 6d.

This will be specially referred to.

Somaland.

Petermann M. 43 (1897): 7-15.

Smith.

Dr. A. Donaldson Smith's Expedition durch das Somali- und Galla-Land zum Rudolf-See in den Jahren 1894 und 1895. Nebst Bemerkungen zur Karte von Dr. H. Hassenstein. With Map.

South Africa.

Worsfold.

South Africa, a Study in Colonial Administration and Development. By W. Basil Worsfold, M.A. Second Edition. Revised. London: Methuen & Co., 1897. Size 8 x 5½, pp. xii and 308. Map. Price 6s. Presented by the Publishers.

This book has been revised and enlarged by the addition of chapters on recent events in South Africa. The map shows the most recent railway advances.

South Africa.

Foa.

A travers l'Afrique Centrale. Du Cap au Lac Nyassa. Par Edouard Foa. Paris: E. Plon, Nourrit & Co., 1897. Size 7½ x 5, pp. viii and 332. Map and Illustrations. Presented by the Author.

An interesting popular account of a journey from Capé Town to Lake Nyasa, with good illustrations.

South and Central Africa.**Foa.**

Edmond Foa, Explorateur. Mes grandes chasses dans l'Afrique Centrale. Paris: Firmin-Didot et Cie., 1895. Size 11 x 7½, pp. 340. *Portrait and Illustrations. Presented by the Author.*

M. Foa was very successful as a sportsman, and this story of his exploits in big-game shooting is written with an enthusiasm and a modesty pleasant to meet with. The volume is appropriately dedicated to Mr. Selous, "the valiant lion-killer, the experienced and truthful author."

West Africa.*National G. Mag.* 3 (1897): 1-15.**French.**

The Gold Coast, Ashanti, and Kussasi. By George R. French. *With Illustrations.*

West Africa.**Toutée.**

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(*E. Stanford, Agent.*)

Europe.

Historical Atlas of Modern Europe from the Decline of the Roman Empire; comprising also maps of parts of Asia and of the New World connected with European History. Edited by Reginald Lane Poole, M.A., Ph.D., Lecturer in Diplomatic in the University of Oxford. Part v. Oxford: Clarendon Press; London, Edinburgh, and Glasgow: Henry Frowde; Edinburgh: W. & A. K. Johnston. 1896. Presented by the Clarendon Press.

Part V. of this atlas contains the following maps. No. XXI. Anglia Monastica, showing the principal religious houses in the time of Henry VIII, together with the dioceses formed after their suppression, with explanatory letterpress by Miss A. M. Cooke, M.A. No. LI. Scandinavia, 1658-1815, with explanatory letterpress, by R. Nisbet Bain, of the British Museum. No. LXXVII. Western Asia under the Abbasid Caliphs, 780, with explanatory letterpress, by Stanley Lane Poole, M.A.

Hungary.

Geologische Karte von Ungarn, herausgegeben von der Ungarischen Geologischen Gesellschaft, unter Mitwirkung der kónigl. ung. geologischen Anstalt und des Herrn A. Semsey von Senso. Buda Pest, 1896. Scale 1:1,000,000 or 15.7 stat. miles to an inch.

Italy.

Istituto Cartografico Italiano.
Carta Idrografica del Fiume Sele. Scale of 1:250,000 or 3.9 stat. miles to an inch. Carta Idrografica del Bacino del Fiume Volturno e del litorale fra i Fiumi Garigliano e Tusciano. Scale of 1:250,000 or 3.9 stat. miles to an inch. Istituto Cartografico Italiano, Roma. Presented by the Istituto Cartografico Italiano.

Italy.

Istituto Cartografico Italiano.
Carta delle Strade Ferrate Italiane, 1897, pubblicata per cura del R. Ispettorato Generale delle Strade Ferrate dall' Istituto Cartografico Italiano, Roma. Scale 1:1,500,000 or 23.8 stat. miles to an inch. Presented by the Istituto Cartografico Italiano.

Rome.

Istituto Cartografico Italiano.
Pianta di Roma redatta su quella pubblicata per il Comune di Roma dall' Istituto Cartografico Italiano. Edizione 1896 (modificata e corretta). Scale of 1:8000 or 7.9 inches to a stat. mile. Presented by the Istituto Cartografico Italiano.

Switzerland.

Swiss Federal Staff.
Topographischer Atlas der Schweiz in Massstab der Original-Aufnahmen nach dem Bundesgesetz vom 18. December 1885 durch das eidg. topogr. Bureau gemäss den Direktionen von Oberst Siegfried veröffentlicht. XLVI. Lieferung.

Nr. 51 bis, Hagenau; 61 bis, Vor der Argon; 300, Mont la ville; 365, Jaun; 417, Sammann; 446 bis, Hermann; 447, Versetz; 448, Meulder; 440, Dardagny; 449 bis, Chanoy; 469, l'Etivaz; 502, Vergeletto. Price 1 mark each sheet.

ASIA.

Caspian Sea.

Andrusow.

Karabugas Kärtchen von Dr. Nic Andrusow. Scale 1: 60,000 or 0.94 stat mile to 1 inch. Petermann's 'Geogr. Mittheilungen,' Jahrgang 1897, Tafel 4. Justus Perthes, Gotha, 1897. Presented by the Publisher.

Indian Government Surveys.

Surveyor-General's Office, Calcutta.

Indian Atlas, 4 miles to an inch. Quarter-sheets: 39 a.w., parts of districts Ahmednagar, Kolaba, Poona, Satara, and of Native States Bhor and Phaltan (Bombay Presidency); 125 a.w., parts of districts Mymondah (Bengal) and Sylhet (Assam).—India, showing railways, corrected up to March 31, 1896, 50 miles to an inch.—Bombay Surveys, 1 inch to a mile, Sheets: No. 209, parts of district Ratnagiri and Sarantvadi State, Seasons 1893-94; No. 210, parts of district Ratnagiri and Sarantvadi State, Seasons 1894-94; No. 278, districts N. Kanara and Dharwar, Seasons 1888-90; No. 310, portion of district Dharwar, Season 1893-94; No. 311, district Dharwar, Season 1893-94.—Bengal Survey, 1 inch to 1 mile, Sheet No. 390, Districts Mymondah and portions of Sylhet (Assam), Seasons 1854-56 and 1860-62.—Central India and Rajputana Survey, 1 inch to a mile, No. 419, parts of Bijawar, Panna, and Tehri Native States (Central India Agency), Seasons 1860-61-62 and 1870-71.—North-West Provinces and Oudh Survey, 1 inch to a mile, Sheet No. 17, districts Musaffarnagar and Meerut, Seasons 1875 and 1880.—Upper Burma Survey, 1 inch to a mile, Sheet No. 263, districts Mandalay, Saguing, and Kyaukse, Season 1893-94.—Lower Burma Survey, 1 inch to a mile, Sheets No. 421, district Amherst, Seasons 1890 to 1895; No. 478, district Amherst, Seasons 1893 to 1895.—South-Eastern Frontier, 1 inch to 8 miles, Sheet No. 2, second edition, parts of districts Akyah and Arakan (Lower Burma), of Minbu, Myingyan, Moikilla, Lower Chindwin, Saguing, Palkoku, Yamethin, Mogwi, and Kyaukse (Upper Burma), and of Chittagong and Chittagong Hill Tracts (Bengal), Seasons 1853 and 1853-63.—South-Western Asia, 1 inch to 4 miles, Sheets Nos. 66 s.w. and 66 a.w., parts of Arabia, Seasons 1891-94.—Route-map for the Western Himalayas, Kashmir, Punjab, and Northern India, with portions of Afghanistan, Baluchistan, etc (including the former Kashmir Route-map), 1 inch to 32 miles, with additions to railways, 1895.—District of Rawul Pindi, Sheet No. 1 of the Kohistan of the Sind Sagar Dumb, 1 mile to an inch; 4 sheets, with additions to railways up to 1895.—District Bhagalpur, Bengal, 1 inch to 16 miles, 1890.—District Chittagong, Bengal, 1 inch to 8 miles, 1889.—District Singhbhum, Bengal, 12 miles to an inch, 1890.—District Fatchpur, N.W. Provinces and Oudh, 8 miles to an inch, 1893.—Bastar Feudatory State, Central Provinces, 16 miles to an inch, 1896.—Punjab, 30 miles to an inch, 1890.—District Cutlack, Lower Provinces, Bengal, 4 miles to an inch, second edition, 1896.—District Faridpur, Lower Provinces, Bengal, 4 miles to an inch, additions and corrections up to March, 1896.—District Jessore, Presidency Division, Lower Provinces, Bengal, 4 miles to an inch, additions and corrections to 1899.—District Khulna, Presidency Division, Lower Provinces, Bengal, 4 miles to an inch, additions and corrections to May, 1893.—District Mungerpur, Lower Provinces, Behar, Bengal, 4 miles to an inch, additions and corrections up to April, 1896.—Conventional signs to be used on topographical maps, 1896.—Conventional signs to be used on topographical maps for reduction.

(Stanford, Agent.)

Japan.

Rein.

Das Seebeben von Kaniatschi am 15 Juni 1896 von J. Rein. Scale 1: 1,000,000 or 15.8 stat miles to 1 inch. Petermann's 'Geogr. Mittheilungen,' Jahrgang 1897, Tafel 3. Justus Perthes, Gotha, 1897. Presented by the Publisher.

AFRICA.

Istituto Cartografico Italiano.

Abyssinia.

Schizzo Dimostrativo della Regione compresa tra Massaua-Adna-Cassala. Scale 1: 333,000 or 5.2 stat. miles to an inch. Istituto Cartografico Italiano. Roma, 1897. Presented by the Istituto Cartografico Italiano.

Egyptian Sudan.

Carta del Teatro della Guerra nel Sudan Egiziano, tratta dalle migliori e più recenti carte militari inglesi per cura dell' Istituto Cartografico Italiano. Scale 1 : 2,000,000 or 31.8 stat. miles to an inch. *Presented by the Istituto Cartografico Italiano.*

Istituto Cartografico Italiano.

GENERAL.**The World.**

Atlas für Handelsschulen, berechnet und redigiert von Dr. K. Pencker. Fachmännisch bearbeitet von Dr. Th. Cleasch, Professor an der Wiener Handels-Akademie, J. G. Rothang, Fachlehrer an d. Wels'schen u. Beamteneschulcoer-Handelschule und Dr. Karl Zehden, k. k. Regierungsrath, Professor an der Wiener Handelsakademie. Wien, 1890. Verlag von Artaria & Co. *Price* 3.75 fl. *Presented by the Publishers.*

Pencker.

All the principal maps in this atlas are orographically coloured, and numerous diagrams are given illustrating the wealth and trade of the several countries. Communications by land and sea are laid down, and at the end of the atlas plans of the principal cities of the world are given.

The World.

Philip's New Handy General Atlas of the World—a series of 60 plates, containing over 120 maps and plans, illustrating physical, political, and commercial geography. Edited by George Philip, Junr., F.R.G.S. With a complete index of over 100,000 names. London: George Philip & Son, 1897. *Price* £1 10s.

Philip.

Several maps have been added to the present edition of this atlas, and those requiring correction have been revised. It now contains 120 maps and plans, and is a good useful atlas for general reference.

CHARTS.**United States Charts.**

Pilot Charts of the North Atlantic and North Pacific Oceans for February, 1897. U.S. Department of the Navy, Bureau of Navigation. Published at Washington, D.C., December, 1896, at the Hydrographic Office. Charles D. Sigbee, commander U.S.N., Hydrographer. *Presented by the U.S. Hydrographic Office.*

U.S. Hydrographic Office.

PHOTOGRAPHS.**Sandwich Islands, Samoa, etc.**

Fourteen Photographs of Hawaii, Samoa, and St. Helena, taken by Colonel A. Swinton, R.A. *Presented by Colonel A. Swinton, R.A.*

Swinton.

The set of photographs contains eleven views illustrating the scenery of the Sandwich Islands, and a portrait of a native schoolmistress, one view taken on the Island of St. Helena, and one of a Samoan hut.

South Africa.

Fifty-eight Photographs of South-East Africa, including scenes in Capetown, Natal, Transvaal, Zululand, East Coast Ports, and Swaz, taken by F. J. Wootton Isaacson, Esq. *Presented by F. J. Wootton Isaacson, Esq.*

Wootton Isaacson.

This is an interesting series of photographs taken by Mr. Wootton Isaacson during his travels in South and East Africa. There are many characteristic views of the scenery of the country adjacent to the coast, and the different towns in the Cape Colony, Natal, the Transvaal, and East Africa.

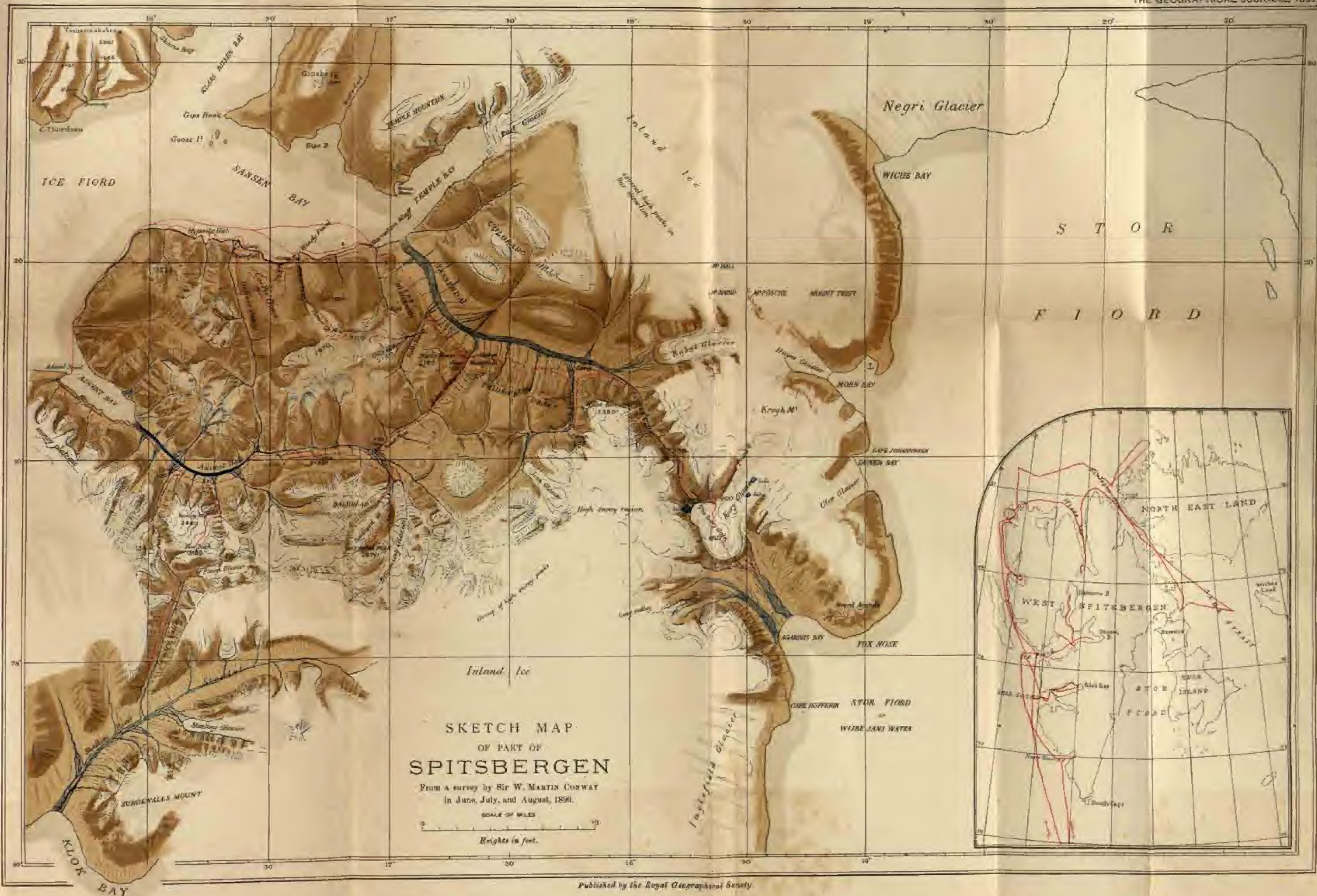
South Central Africa.

Forty-one Photographs of the Marotse Country, Victoria Falls, Mashikolumbe Country, etc., taken by Captain A. St. H. Gibbons, 1895-96. *Presented by Captain A. St. H. Gibbons.*

Gibbons.

The photographs, taken by Captain Gibbons during his recent travels in Africa, form a valuable addition to the Society's collection. Among them are some of the Mashikolumbe country and people, which are of great interest.

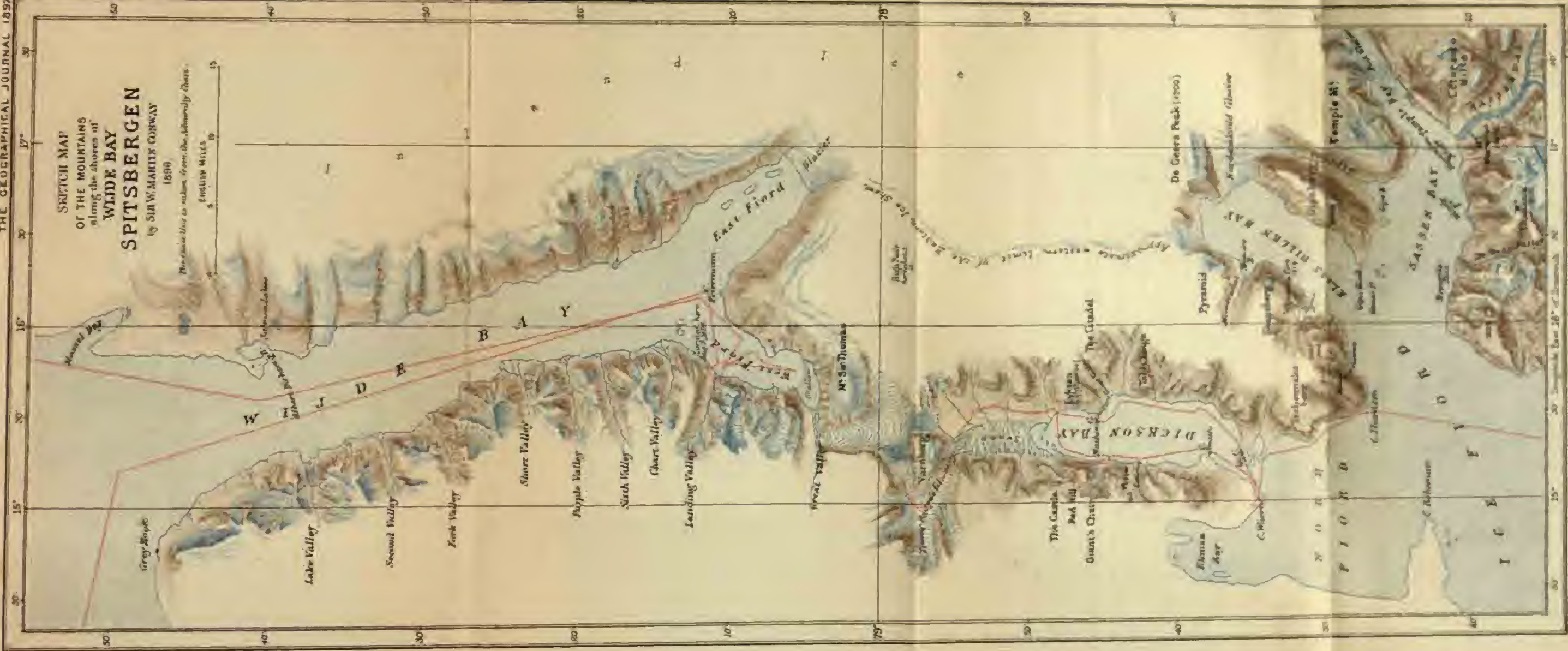
N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



SKETCH MAP
OF THE MOUNTAINS
along the shores of
WILDE BAY
SPITSBERGEN
by SIR W. MARTIN OSBORN
1896

This sketch map is taken from the Admiralty Charts.

ENGLISH MILES
0 5 10 15



SHOWING THE SURVEY BY
G. E. S. VANDELEUR D.S.O. LIEUT: SCOTS GUARDS
1895.

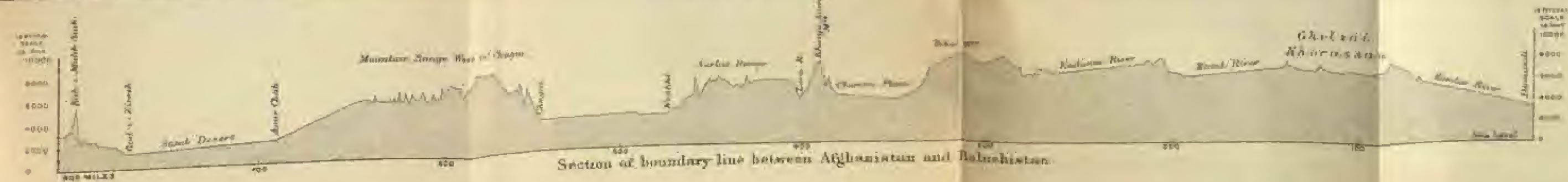
1: 1000000 or 1 Inch = 15.75 Miles

Home in Red





Scale of Miles.



The Geographical Journal.

No. 5.

MAY, 1897.

VOL. IX.

SOME RESULTS OF THE NORWEGIAN ARCTIC EXPEDITION. 1893-96.*

By FRIDTJOF NANSEN, D.Sc., D.C.L., LL.D.

It might seem desirable to lay before the readers of this Journal a full survey of the additions to our knowledge of the northern regions and their physical conditions acquired during the three years we spent there. But the material we brought home is so abundant, that a long time must elapse before it can be put into shape by the various specialists. It is obvious, then, that only after such preparation will it be possible to give any complete account of the results themselves and of their scope. An attempt to give some of these results now would undoubtedly be to run the risk of making many errors, of giving a false impression of what the expedition has contributed to science, and, in addition, the survey itself would be very imperfect. But the Royal Geographical Society may rightly expect to hear something of the results, and so I shall give what I can, though on the express understanding that this is only a provisional account, which has no pretension to be other than a vague outline of a few of the results and investigations which, at the moment, seem to be of importance. I will begin with that branch of science with which this Society is particularly concerned—geography.

When due regard is had to the manner in which this expedition was planned and carried out, it is not in the nature of things to expect that any great geographical discovery, as the term is popularly understood, would be the result. Our expedition was intended to be a sea-expedition pure and simple, which was to drift with the drift-ice and,

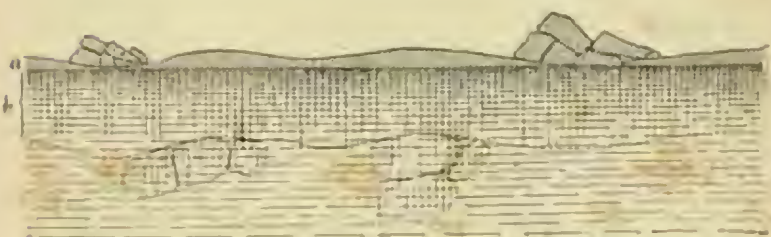
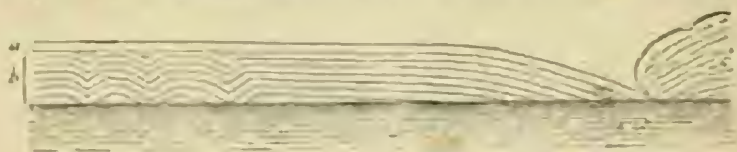
* Map, p. 568. For the illustrations which accompany this paper we are indebted to Messrs. Constable & Co., the publishers of Dr. Nansen's 'Farthest North.' The route-map, with certain modifications, has also been reproduced from the same work.

by preference, keep clear of all land. The discovery of new lands can therefore hardly be said to have been our object, and we were fortunate enough, I had almost said, not to discover any. I say fortunate, for the reason that such new lands might easily have prevented the successful issue of the expedition, as they would have stopped the drift of the ice. But negative results are also an outcome, and I think I may say that the expedition has contributed not a little to the increase of our knowledge of the distribution of land and sea in the regions nearest the north pole.

Before entering upon further reference to this, I will, however, first dwell shortly on some small changes in the configuration of the coasts along which we travelled. The first and foremost of these was the coast of Asia, where we made some discoveries of minor importance. In the Kara sea we discovered an island which, after its discoverer, was called Sverdrup's island. Along the coast of Asia we discovered several new islands and groups of islands. We landed on Kjelman's islands, discovered by Nordenskjöld, and made various observations of interest regarding their appearance and extent. North-east of these we found a group of islands we called Scott Hansen's islands; north-east of these, again, lie Clements Markham's islands; north of them are the Ringnæs islands; north-east are Mohn's islands; and east of some others, and nearer the coast, lie General von Tillo's islands. When we arrived at Taimyr island, which was visited by Nordenskjöld, we made a discovery of greater importance. We found that our way was barred by land-fast unbroken ice. As will be remembered, there are, according to Nordenskjöld's chart, on the north side of this island, due north of Cape Laptev, three or four islands only, and these he called Almqvist's islands. We thought, therefore, that it must be an easy matter to find a way outside them; but, to our astonishment, we continually found new islands stretching further and further north, and when we at last reached the northern extremity of these, there was still no passage; the ice lay close in to the coasts. They appeared to be an extensive group of islands, and for a long time I was in doubt as to whether what we had on our east were a large continuous land or several islands of lesser extent, as wherever I turned the glass inwards I saw land. The weather, however, was so thick that one could not see far, and I am inclined to think that they are a large group of islands lying at the northern end of Taimyr island.

I have called them after the man who showed us the way along the coast of Asia, the discoverer of the north-west passage; they bear the name of Nordenskjöld's islands. I am, however, inclined to believe that this group of islands had already been discovered, and that by the Russian Laptev, who travelled along the coast in sledges, but by whom they were taken for a continuous island, and that in reality they are the same as those marked on the older Russian charts as Taimyr island, which is separated from the mainland by a broad sound. The latitude

also seems to coincide with this, although the most northern islands in our group are situated a good way north of the Taimyr island of the Russian chart. I think, then, that the Taimyr island found by Norden-skjöld was in reality taken by Laptev to be the mainland, and that the Taimyr sound found by him is, in point of fact, a new discovery. It seems very reasonable to suppose that a sound as narrow and crooked as this one, which one cannot see right through, would not have been discovered by persons passing quickly by, especially when travelling in sledges. When we were there, I could not myself, even from the crow's-nest on the main mast of the *Fram*, clearly discern what it was, as it looked like a small closed-in fjord. It seems inconceivable to me



ICE STRATIFICATION.

that any one, even had he really discovered the sound, could have marked it on the chart as the broad strait we find between Taimyr Island and the mainland on the Russian charts.

After being stopped at the north end of this group of islands, we were constrained to turn back again and make an attempt further south. We hoped for Nordenskjöld's Taimyr sound. There, however, progress seemed somewhat difficult, and we lay to for several days to investigate the sound further before daring to penetrate into it with the *Fram*. There too we made several discoveries, finding the land indented by fjords and sounds, and with many islands outside. At last on September 6 a gale broke up the ice, and we were able to get past Cape Laptev and into Taimyr bay. Great, however, was our astonishment to meet here, halfway in the bay according to the old charts, low sandy land stretching out like a broad tongue into the Taimyr sea. I called this tongue of land King Oscar's peninsula. In what manner it trends southwards we naturally could not determine for

more than a very short distance, and I have therefore tried to unite it as well as I could with what the earlier charts indicate as the coast about the mouth of the Taimyr river farther south, and which one may suppose to be fairly correctly placed.

On the east side of this tongue of land, as will be seen by the charts, a shallow bay runs into the land, which we called Toll's bay. A little further north we found a deep fjord, which penetrated inland as far as I could see, and which was probably the mouth of a good-sized river. The coast of the whole of the Chelyuskin peninsula northwards is very low, while inland we observed somewhat high mountain ridges, partly covered with snow, and on some I should almost be inclined to think there were small glaciers. Near Cape Chelyuskin itself there was a table-mountain (Mount Elvind Astrup) of medium height, which appeared to consist of some kind of sedimentary rock formation. On the west side of Cape Chelyuskin we found two small groups of islands—Fearnley's islands and Axel Heiberg's islands. Farther east there also seemed to be some small changes to be made in the trend of the coast-line. Thus the north-east corner of the Chelyuskin peninsula appeared to stretch somewhat farther north than it is usually marked: while the coast east of Thaddeus inlet, and the islands Peter and Paul, lay somewhat more to the south, as, according to our course, we should have sailed right over them without seeing them. I will not, however, dwell longer on these less important matters.

Without comparison, the most important geographical discovery made during our voyage was that concerning the polar basin itself. This had hitherto generally been considered to be a shallow sea,* in any part of which it might be expected to find land. This was pointed out at the meeting of the Royal Geographical Society during the discussion that took place before my departure. The reason of this assumption was the fact that, so far as the sea had been examined hitherto, it was everywhere shallow. In the sea south of Franz Josef Land and Spitzbergen, there was a depth of as much as 160 fathoms, while along the coast of Siberia not more than 40, at most 80, fathoms had been found. Then the expeditions which had penetrated northwards into this sea had always discovered new land. Thus the Austro-Hungarian *Tegethoff* expedition discovered Franz Josef Land during its drift, and the *Jeannette* expedition discovered Henrietta island, Jeannette island, and Bennett island. In the plan of this expedition, I urged the possibility that a deeper channel might run across the unknown polar basin, uniting the Atlantic Ocean with the tract where the *Jeannette* had drifted: I drew attention to the fact that the sea stretching

* Not all authorities were of this opinion, however: twenty years ago had Sir Clements Markham maintained that there was deeper water to the north of Franz Josef Land, as will be mentioned later.

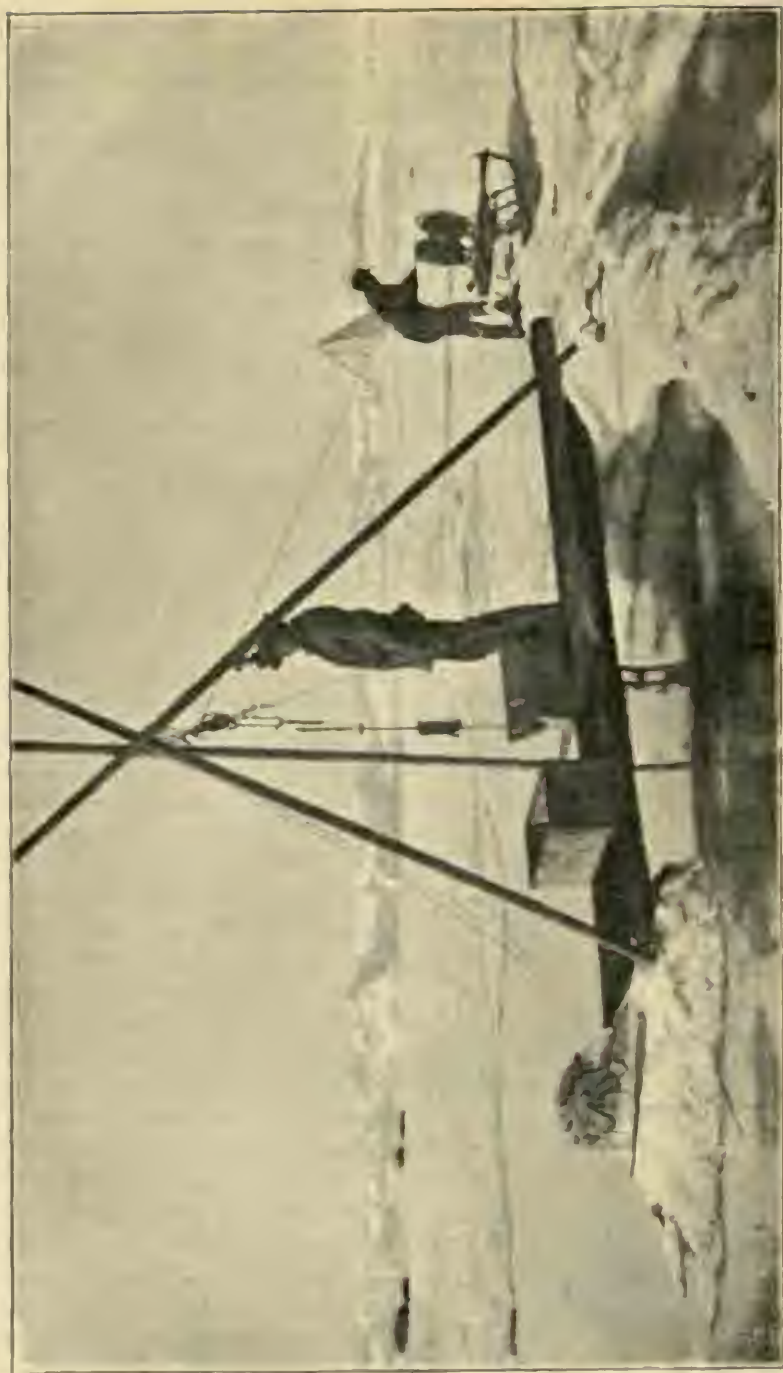


TAKING A SOUNDING OF 2038 FATHOMS

northwards between Spitsbergen and Greenland was very deep—up to 2600 fathoms; and, at the same time, that the *Jeannette* seems to have found an increase in the depth northwards, or possibly only a narrow channel of water 80 fathoms deep, while on either side there were only 40 fathoms or less: and I then thought that these facts might possibly be connected with each other. I had, however, imagined the polar basin, taken as a whole, to be shallow. We found great depths, the sea in lat. 79° N., north of the New Siberian islands, suddenly becoming deeper and sinking to a depth of 1800 to 2000 fathoms, and this depth was preserved during the entire drift of the *Fram* north-west and west, as far as north of Spitsbergen. It is my opinion, thus, that not only does such a channel exist, as I had surmised, but that we must take it for granted that the polar basin, considered as a whole, is a deep sea which forms a continuation northwards and eastwards of the same depth as the northern part of the Atlantic Ocean. How far this deep sea extends to the east it is difficult to form any opinion; we know now that it goes as far as to the north of the New Siberian islands, but it is only reasonable to suppose that it extends still further east, since, in the case of the *Jeannette*, every time the drift set her northward or north-eastward, the depth of the sea was found to increase.

What, then, is it reasonable to suppose with regard to the distribution of land and sea in the yet unknown polar area? I think we may with safety say that little or no land can lie on this side of the pole, as it is not probable that such a deep sea should only be a narrow channel. It appears to me to be too continuous for this, and on this account alone I should be inclined to think that it extends a good way north of that part of the sea traversed by us. In addition to this, we saw no indication whatever of land in any direction. During our sledge-journey north of the *Fram's* route, the ice appeared to be drifting with great speed—even greater than that of the ice we found further south. There was a great deal of movement in the lanes, and at different times we were carried away in different directions with some rapidity—so rapidly, in fact, that it sometimes seemed as if we had been given up, helpless, to the violence of the wind and current. Masses of ice like these could hardly move with such great freedom in different directions if land of any extent were in the vicinity, as this would cause insurmountable obstacles to the drift. It ought also to be remembered that this was particularly the case every time the wind carried us in a northerly or north-westerly direction, but that, on the other hand, the drift seemed to be unusually sluggish every time we were set back towards the south-east.

A good indication as to how far tracts of land of any extent are to be assumed farther north or not, we shall certainly find in our meteorological observations; the course of the isotherms and the



DEEP-WATER THERMISTATE. "UP WITH THE THERMISTATE."

distribution of the atmospherical pressure, the directions of the wind, etc., must tell us something of the matter. Unfortunately this great mass of material has not yet been investigated, so that I shall reserve all mention of it till some future date. I will only for the present remark that, from these data, hitherto I have not been able to find any indication of tracts of land north of us. There is, however, one thing which causes me to think that we are right in supposing the polar sea to be of greater extent north of our route, and that is the drift-ice itself. If the *Fram* had continued her drift in the ice instead of working herself out of it north of 83° N., there is no room for doubt but that she would have been drifted southwards in the vicinity of the east coast of Greenland. She would have come towards known waters with the drift-ice which is carried down by the east Greenland polar current, and which we know so well from Scoresby's description of it. It was the same drift-ice which we had struggled with for three years.

It is not, however, reasonable to suppose that the *Fram* would have drifted close under the east coast of Greenland; she would undoubtedly have had a broad belt of ice between her and the coast, and the ice composing this belt must, it goes without saying, proceed from a part of the polar sea which lay to the north of us during our drift, and this part may be of fairly great extent. If, for instance, we look at the relation between the polar sea itself and its masses of ice, and the east Greenland polar current and the continual transport of ice, it suggests a comparison between these relations and those which exist between a vast expanse of inland ice and its ejection through a narrow ice-valley, such, for instance, as we find in the ice-fjords of Greenland. In the inner polar basin, where the *Fram* drifted, the ice, as in the interior of the inland ice, was very slow in its movement. By degrees, however, as it approaches its outlet the movement augments, the ice streams off with greater and greater speed southwards, until it at last comes south, where it is broken up by waves and wind, and melts in the warm water. It is in the same manner that the offshoots of the inland ice stream out through the ice-valleys and the ice-fjords and down into the warmer strata of air, there to melt and finally emerge into the sea, where, broken off, they float away in the form of icebergs. A certain breadth of ice-belt in the polar current of the east coast of Greenland must consequently correspond to considerably broader and more extensive parts in the known or unknown polar sea. I think, consequently, that we may with certainty conclude that on this side of the pole there is an extensive ice-covered sea. There is, on the contrary, a possibility of the existence of land of some extent on the other side of the pole. It is hardly reasonable to suppose that the northern confines of the American arctic archipelago have yet been reached. We may expect to find islands, perhaps islands of some magnitude, north of the limit which has been reached. A closer

examination of these parts, we must hope, will be undertaken in a not distant future.

Before I conclude this short summary of the geographical results of the expedition, I must touch on a point which may be of some importance, and this is the character and extent of Franz Josef Land. The drift of the *Fram* has, as before mentioned, revealed to the north of Franz Josef Land a deep sea, and that this land can have no such extension northwards as has been surmised in several quarters. The discoveries made during Johansen's and my sledge-journey over the ice serve only the more to corroborate this statement. The discoveries we made here may not seem overwhelming to some people; for already twenty years ago the President of this Society, Clements Markham, said, "Franz Josef Land seems to be a part of the Spitzbergen group, rising out of the same shallow sea, with deeper water to the north."

This expression of opinion was then a somewhat isolated instance, and aroused contradiction rather than the reverse, at a time when it was customary to consider Franz Josef Land as the south coast of an extensive mass of land. I can now, after having myself explored part of this "deeper water to the north," give this opinion my full and entire concurrence. When I addressed this Society before my departure, I expressed it as my opinion that Franz Josef Land was not an eligible point of departure for an expedition to the pole if the object were to press forward overland, seeing that I regarded Franz Josef Land, as I then said, as merely "a group of islands." Our expedition seems also to corroborate this. Franz Josef Land not only proves now to be a group of islands, but a group of comparatively very small islands. How far they extend to the northward we cannot yet determine with precision, but, in any case, their extent in this direction cannot be of importance. Petermann's Land cannot be of any great size, for otherwise we must have seen it when we went southwards in the summer of 1895.

That Oscar's Land, also, is of no great extent I think I may conclude, from the fact that the ice on the north coast outside our winter quarters appeared to drift unhindered from the land towards the north every time a southerly gale sprang up. If there had been land of any extent in that direction—that is to say, where Oscar's Land should lie—it would assuredly have hindered the drift of this ice. Of the extent of the land in an easterly direction, it is difficult at present to form any opinion. When we came west from Hvidten Land—the first islands discovered by us—and perceived the chain of islands west and south of us, they stretched like an apparently continuous coast, here and there only divided by small sounds and fjords. The southernmost land that we saw was Wilczek Land, which, however, seemed to disappear in a south-easterly direction, and we saw no land farther east. On the

other hand, to judge by the sky, there were signs denoting a considerable quantity of open water. That there really are islands in that direction, however, seems possible, from the fact that when we were encamped, during June and July, in about lat. $85^{\circ} 5'$ N. and long. 63° to 64° E., where we lay for a month, waiting for the deep snow to melt in order that our progress southwards might be easier, we had, several times during the month, long periods of strong northerly wind, yet without its being able to drive us farther south, although the ice seemed to move tolerably unhindered in other directions. This might indicate that there was a wall of land to the south of us, running east and west, and stopping the drift of the ice.

I think it is probable that the group of islands composing Franz Josef Land extends very much farther west than we now know, since neither Jackson nor we saw the limits of the land westwards on the north side of Alexandra Land. In point of fact, we discovered new islands in the west as far as our range of vision admitted, and, to judge by the large open land-lane which ran in that direction, one might suppose that the land there was of considerable extent. On the south side of Alexandra Land, Leigh Smith, equally with Jackson, failed to find the western limits of the land. Set this beside the fact of the new land discovered by the Norwegian sealers on the east side of North-East Land, the so-called White island or New Iceland, which is probably the same as the mystical Gillies Land; it is then reasonable to suppose that between these lands there lies a continuous chain of islands, which in reality connect Franz Josef Land with Spitzbergen, and would be so closely continuous, that it would be difficult to say where the one group of islands ends and the other begins. On this point, too, Clements Markham's words, that "Franz Josef Land seems to be a part of the Spitzbergen group," hold good. The geological structure of Franz Josef Land seems also to indicate that this is actually the case, and it is my intention to touch on this directly. In these parts, which Johansen and I should have visited had we not fallen in with Jackson, the Jackson-Harmsworth expedition will no doubt have many interesting discoveries to make.

Before I leave the geography of Franz Josef Land, I have a few words to say relative to the map.

I will first mention a discrepancy between our experiences and Payer's map, a discrepancy which has been the subject of a good deal of discussion, and perhaps also of misunderstanding. It was, however, this discrepancy which brought us to think that the land we met with could not be the Franz Josef Land visited by Payer. It was our opinion, therefore, that our watches must be altogether wrong, and that we had come to a land much further west—either the west coast of Franz Josef Land, or more correctly Alexandra Land, or perhaps Gillies

Land, or some other new land situated between Franz Josef Land and Spitzbergen. Where Payer placed the north end of Dove glacier and



THE NORTH END OF DOVE GLACIER.

the entire north end of Wilczek Land, we found only sea, with the exception of the four islands which I named Heiden Land. Of Payer's

Rawlinson's sound we saw nothing, nor the north end of Austria Sound, and his Wilezek Land becomes in reality a smallish island, the northern extremity of which lies about one degree further south than he placed it. I could hardly conceive such a mistake, seeing that the land lay comparatively near his route, and therefore could not for a moment suppose that his map was incorrect, but rather that our watches were wrong. It was only after we had met Jackson and compared our watches, that I discovered that such must nevertheless be the case.

I have thought much as to how this error can have arisen, particularly as Payer's map, on the whole, is so carefully drawn, and, in my opinion, satisfies all the demands which can be made on a map prepared by a man travelling so quickly through a country. Dr. Copeland is now engaged in working on Payer's great materials for a map, and through the kindness of the former I have been enabled to convince myself of the unusual reliability of this important material. I have also seen Payer's sketches, and have been able, through them, to recognize several of the lands seen and visited by us. I think that, by a comparison of Payer's observations with ours, some more exact idea of the northern configuration of this group of islands could be arrived at. When one looks at Payer's sketches and reads his description of his journey northwards towards Crown Prince Rudolf's Land, one receives the impression that it must be easy to make a mistake like that made by him, which was destined to be so fateful for us. It arose from the circumstance that during the greater part of the time he was there he had fog and thick weather, and he says himself that he was under the impression that Wilezek Land ceased a little way north of 81° N., just as it does in reality; but one clear day (April 7) he was, as has been mentioned, disabused of this error, and, as he himself writes, "When the sun scattered the driving mist, we saw the glittering ranges of its enormous glaciers—the Dove glaciers—shining down on us. Towards the north-east we could trace land trending to a cape lying in the grey distance—Cape Buda-Pest, as it was afterwards called. The prospect thus opened to us of a vast glacier-land, conflicted with the general impression we had formed of the resemblance between the newly discovered region and Spitsbergen."

What Payer really saw here were, I think, banks of mist on which the sun was shining, and which on such occasions can have a misleading resemblance to glaciers—a fact which we often had occasion to notice during our journey. These banks of mist extended northwards from Wilezek Land over Hvidten Land, and so onwards towards Prince Rudolf's Land. Perhaps, too, Payer did really see the top of the glacier on the largest of the islands of Hvidten Land—the upper one, which I called Ewa island; then, too, he probably saw the nearest of these islands, and has marked it by the name of Frieden Insel.

I can understand all the more easily that such a mistake may arise, since I very nearly was guilty of the same thing myself, seeing that

when I came southwards through the sound discovered by Jackson—the British Channel—along the west coast of Hooker island, I thought all the while that we had a vast continuous glacier-land on our west. It was only when the mist lifted and it cleared on the evening of June 11, that we discovered the broad sound which lies between Northbrook island and Bruce island on one side, and Alexandra Land with Peterhead on the other. Had not this happened, and we had been constrained to make a map of these parts without receiving later information, I should have been guilty of exactly the same mistake as that of Payer farther north, and thus I do not reproach him in any way.

Between our observations and Jackson's map of the land observed by him there are but few discrepancies to be mentioned here. The most important, perhaps, is that the land which Jackson saw to the north, and which he supposed to be King Oscar's Land, is in reality some small islands lying west of our winter hut, some 40' farther south; we saw them not far from us the whole winter. Jackson, however, expressly states on his map that it was the "approximate position, very misty, distance uncertain, and single bearings;" and when he saw my map he agreed that the land he had seen must be our three islands, for which reason I have not given them any name. The alteration in the position of this land makes it necessary, however, to move Queen Victoria sea, so-called by him, a little further south. This open water, which was fallen in with by him as well as by us, and which we had occasion to see being formed during the course of the winter, cannot, however, be regarded as any open sea; such a designation would easily lead to misconceptions, as this open water must rather be regarded as a land-lead, which, like all other land-leads, is formed and opened by a land-breeze, and is closed again by the wind blowing in-shore. This discovery of open water on the north side of the islands one had to be prepared for, as exactly the same thing occurred with Payer twenty-two years ago, as he found a piece farther north on the north side of Karl Alexander Land and the west side of Crown Prince Rudolf's Land.

The other minor discrepancies which Jackson's map shows compared with our observations are of so little moment that I will not even name them. With regard to the giving of names on my map, I will only observe here that when I found out that the land on which we had lived during the winter was divided by a sound from Karl Alexander Land*

* It ought, perhaps, to be mentioned that we did not find the sound which, according to Payer's map, should separate Andrée island from Karl Alexander Land. On discussing this matter with Dr. Copeland, he told me that he could not find anything in Payer's material which indicated the existence of this sound. Payer's original sketch-map had no Andrée island or no such sound, and Copeland believed, therefore, that Andrée island and the sound were due to a mistake by the man who made Payer's map after his return from his journey.

By seeing Payer's sketches of Karl Alexander Land, I have been able to identify various promontories. I could especially easily recognize Cape Feider, which has a

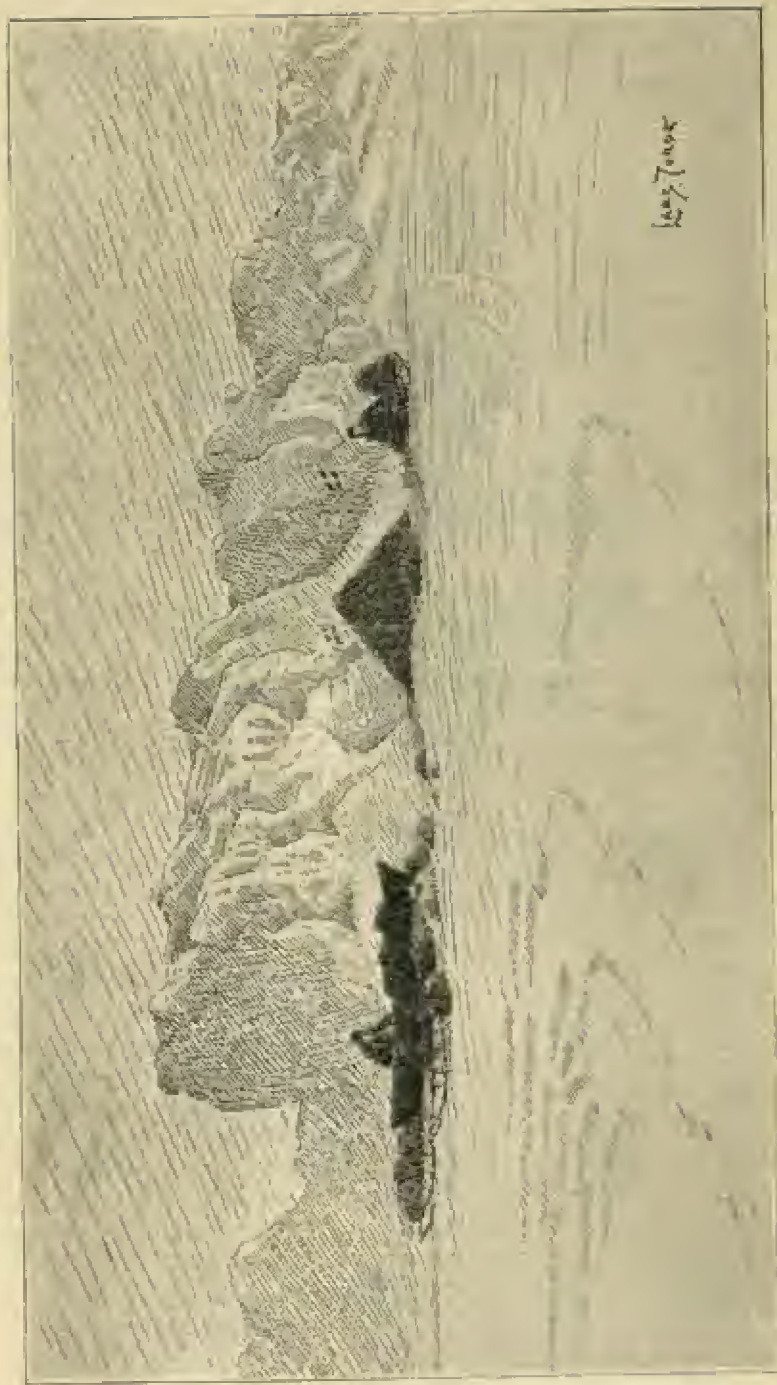
lying north of it, and so named by Payer, I asked Jackson if he had any objection to my calling this land Frederick Jackson's island, as a slight token of our gratitude for his unusual hospitality towards us, and to this he agreed. I have otherwise refrained from giving names to any of the countries which Jackson saw before we did.

The island situated between Jackson's island and Karl Alexander Land I have permitted myself to call after Leigh Smith, as a slight acknowledgment of his important instrumentality in the mapping and investigation of this interesting group of islands. It is, in a measure, a continuation of the work begun by Leigh Smith which the Jackson-Harnsworth expedition has undertaken, and they have already accomplished work deserving of great credit. Jackson's map of the part of the group of islands which he has surveyed gives the idea of great accuracy. Thus, when I compared our observations with his map, I found that for the place where our winter hut was situated, which lies near his northernmost point, there was only a difference of some few minutes. It is particularly unfortunate that, during the last two years, circumstances have prevented Jackson from travelling over a still greater part of this group of islands. In the coming year these difficulties will be surmounted, and we may expect an eminently satisfactory map of the whole extent of this interesting group of islands; one of the more important problems will then be solved yet remaining in the sea on this side of the pole.

In concluding my remarks on the geographical discoveries made by us on our expedition, it may, perhaps, be appropriate to add a few words on the geological character of the countries we visited. The geological investigations we were in a position to make during our voyage along the coast of Asia were necessarily of very small extent, as our visits on shore were of an accidental nature and of extremely short duration. At no place where we landed did we find stationary sediments which were not metamorphosed. As a rule the stationary rocks we met with consisted of crystalline schists and granites; amongst these may be mentioned a characteristic aplitic Muscovite granite from Cape Laptev. On the north-east corner of the Chelyuskin peninsula we observed a very finely grained hollellinta, in its appearance resembling quartzite.

Of more importance were the indications of an ice-period which I thought I found in several places on the north coast of Siberia. The undulating tundra of Yabal, consisting of sand, clay, and small stones (boulders), had already reminded me of the North German plains, and suggested the idea of a vast ground moraine (till). It was full of

peculiar shape, and which Johnsen and I visited on the night between August 16 and 17, 1893 (see *'Farthest North,'* vol. II. pp. 310-312). I describe it in my diary as "a curious high ridge, as sharp as a knife-blade." There is also a photograph from this place in my book, vol. II., facing p. 736.



May 7, 1864

THE SOUTH SHORE CAST, 80° 19' S. LAT., APRIL 8, 1865

round depressions and lakes, which reminded one of the North German lakes, and these so often to be seen on extensive ground moraines. We, however, found no large erratic blocks on these tundras, and our investigations were of such a slight character, that I dare not, at present, form any certain opinion as to the glacial origin of this land. Farther north, indeed, I found unmistakable glacial marks. Thus, on the beach of one of the Kjellman islands, where we landed, I found a striated rock-surface of such a nature that it could not be explained in any other way than as proceeding from the scouring of glaciers. The drift-ice does indeed occasion scratches or striae on the coasts, but this striation is necessarily somewhat superficial, and the scratches are extremely irregular in their direction. The striae I found here, on the contrary, were decided and deep, and ran parallel to each other in a definite direction. That I only found striae of this kind in that part of the beach which is laid dry at low tide, is easily explained by the fact that the surface of the rocks in these regions is so weathered by the prevailing climate that, as a rule, all striation disappears very rapidly, the mountains being fissured and shattered in all directions by the frost.

Wherever we landed up here, the country was covered in all directions with larger or smaller boulders, and these, no doubt, were in some places of the same kind as the stationary rocks. In other places, however, I often found large blocks differing completely from the rock which formed the ground on which they lay. The land on the west side of the Chelyuskin peninsula, at the head of Toll's bay, where I went reindeer-shooting one day (September 8, 1893), had a thoroughly typical till-like appearance. This was a very undulating clay plain, over which were strewn a multitude of large boulders of different rocks, and these could with difficulty be explained otherwise than as being material brought hither by an extensive ice-sheet. This land, too, was of striking resemblance to the plains we know, and which are generally admitted to be glacial ground moraines. The fact that I found an indication of stratification in several places where the clay had fallen away—as, for instance, along the shore and in some stream-beds—can hardly be regarded any longer as an argument against its moraine-like character, as we, for example, know of several incontestable cases of moraines in the south of Norway which have distinct stratification. Even in end moraines such a stratification is commonly found in Norway. It is only a proof that the moraine was formed under the sea.

It may be thought that the glacial traces we found might be owing to local glacier formations; but compare these with what Toll found almost simultaneously with us on the New Siberian islands and at Anabar, where he has pointed out the most interesting remains of an ice-period, and it must be conceded that the probability is that at any rate a considerable part of the north coast of Siberia must have been

buried under an ice-sheet like that which in its time covered the whole of Northern Europe, and the exemption from an ice-period, which it has been endeavoured to grant Siberia, no longer holds good. The entire configuration of the Siberian coast also appears to indicate that it has had an ice-period here, as outside it there lies a belt of rocks and islands such as very seldom occurs, except off glaciated coasts. Moreover, the coast itself, when we approached it, appeared to be much fringed everywhere with deep fjords, such as are seldom found in other than glaciated lands. I should imagine that the whole of the north-west coast is indented in a similar manner, and the impression given by the ordinary maps of a continuous even coast-line is therefore misleading.

The geological structure of Franz Josef Land is of a very peculiar nature. It appeared, wherever we visited it, to consist of basalts. In the northern parts of the islands these basalts and other plagioclase-pyroxene rocks reached the very shore, and I looked in vain for fossil-bearing strata. Further south, however, near Cape Flora and thereabouts, the basalt did not reach to the sea; but, as the Jackson expedition had already discovered, an immense formation of clay stretched from the shore up to an altitude of from 500 to 600 feet, and on this formation the basalt rested to a height of another 500 to 600 feet. I brought home with me a collection of specimens of basalt from the neighbourhood of Cape Flora, as well as from further north. These have been examined microscopically by Professor Brögger. There is a great difference in the basalt in different parts. While in some places it has a decided porphyritic structure, thereby differing from many typical basalts more resembling many melaphyres, to a very great extent the basaltic lavas have an amygdaloid structure. The cavities are filled with zeolites (especially analcime) and calcite; it was in other parts—at Cape McClintock, for example—very coarse-grained in quality, with diabase structure (doleritic structure), and appears to be closely connected with the diabases (dolerites) and basalts found in Spitzbergen, particularly on Stens Foreland and the Stor Fjord as intrusive sheets. The basic rocks of Franz Josef Land seem to have been formed in the Jurassic period, for the clay formation on which they rested at Cape Flora was undoubtedly Mesozoic (Russian Jura, Lambert-zone), and above the basalt was found, as I shall mention presently, fossil plants belonging to the later Jura period.

It thus appears that Franz Josef Land is, taken altogether, of Mesozoic (Jurassic) formation. These numerous flat basaltic streams, which extend over all the islands at about the same height, seem to tell us that at one time it was a continuous mass of land, which in the course of ages, eroded by the various wasting forces, such as frost, moisture, snow, glaciers, and the sea, has become cut asunder, destroyed, and has partially disappeared under the surface of the sea, while only scattered islands and rocks now remain, separated from each other by sounds and

fjords. These basalts have, as I mentioned before, a striking resemblance to those formed in parts of Spitzbergen; like these, they contain very little olivine and iron ore, and it is probable that Franz Josef Land and Spitzbergen formed a continuous eruptive province, different in age and rocks from the great Tertiary eruptive province of North-Western Europe, Færoe islands, Iceland, Scotland, Ireland, and Greenland.

An interesting discovery was made while we were at Cape Flora. Jackson and the geologist of the English expedition, Dr. Koellitz, finding one day, on a basalt mountain projecting from a glacier, numerous fossil plants. One day later Koellitz and I went there together, and made a valuable collection of them. My comrade Johansen also found his way there one day on "ski," quite unwittingly, and also collected fossils, which he brought to me. These fossils have been examined, since our return, by Prof. Nathorst, and it proves that Jackson and Koellitz's find is a highly interesting one. Prof. Nathorst has, in a letter, given me some preliminary information on the character of these fossil plants, and he says that "in spite of their fragmentary character, the specimens of fossil plants brought home are of great interest, as we are enabled through them to get a glimpse, for the first time, into the plant-world which existed in the latter part of the Jura period in the tracts north of 80° N." The leaves of a certain pine, closely connected with the *Pinus Nordenskiöldi* of the Jura strata of Spitzbergen, East Siberia, and Japan, but probably belonging to a species differing from them, are most common. There are also leaves of another kind, the fragment of a cone,* and several seed-vessels, of which one reminds us of the *P. maackiana* from the Jura strata of Siberia and Spitzbergen. Nathorst, in addition, mentions several other conifers, which, however, I will not touch upon here. Interesting, he says, is the appearance of the genus *Fekilenia*, as it has hitherto only been known in the polar regions. It was first found by Nordenskiöld, in 1869, in the Tertiary strata of Spitzbergen; afterwards by Fekilen, in the Tertiary strata of Discovery bay, in Grinnell Land, during the English polar expedition of 1875-76. It has been found since by Nathorst in Spitzbergen, in the upper Jurassic strata.

The most beautiful in the whole collection are the leaves of a little *Ginkgo*, of which one is complete. This genus, with plum-like seed and with leaves which, unlike those of other conifers, have a real leaf-surface, is now found in Japan in a single species; but it appeared in earlier times in a multitude of forms, and was widely distributed. It was particularly luxuriant in East Siberia in the Jura period, and it is also known from Spitzbergen and Eastern Greenland (near Scoresby's sound), and many places in Europe, etc. The leaf

* Leigh Smith brought home a fossil cone from Franz Josef Land, which Cauterhus decided to be that of a pine: but he supposed it to belong to the upper part of the Chalk system.

represented here belongs to a new kind, which Nathorst has called *Ginkgo polaris*, and which is closely connected with Heer's *Ginkgo flabellata*.

There are also fossils of several other conifers, which, however, I will not enumerate here. "On the whole," says Nathorst of this Jura flora of Franz Josef Land, "it is, by reason of its wealth of conifers, its poverty of ferns, and its lack of sycada (or, at any rate, great rarity of them), of about the same general character as the upper Jura flora of Spitsbergen, although the species may differ; and it would seem that the flora does not testify to particularly favourable climatic conditions, although the difference between then and now is a vast one. The deposit presumably took place in the vicinity of a forest of conifers. As far as can be judged by the material, the flora must belong to the upper white Jura rather than to the more medium brown Jura."

I will conclude these remarks on the geological investigations with a few words on the present bottom-sediment of the polar basin. By examining with the microscope the samples which we secured by means of our soundings, it proved that they differ essentially from the samples taken from the north Atlantic Ocean, as they are wanting in the organic compounds or shells of marine animals which form such an important ingredient in the ground-mud of that ocean. On examination with acids, it was also shown that this mud is particularly deficient in carbonate of lime, and seems to be chiefly of mineral components. There has not yet been time to subject these samples to very careful examination, and I will, therefore, for the present refrain altogether from attempting any explanation of the characteristic composition of this mud. It appears that a deposit of sedimentary strata is now taking place in the polar basin which, however, may prove to be extremely deficient in fossils.

A very important result of the Norwegian Polar Expedition is the glimpse it has given us into the drift and transport of ice in the hitherto unknown polar sea. As I pointed out before my departure, the plan of the expedition was based on the assumption that a current or continual drift of ice must go right across the polar basin from the sea north of Siberia and Bering Straits, and over towards the sea between Spitsbergen and Greenland. It was with this ice that I intended to let the *Fram* drift. My assumption seemed to be at variance in several ways with the current ideas of the nature of the polar sea. Meanwhile the expedition was carried out in accordance with the plan; it has proved that the premises from which I started were more or less correct, and it has enabled us now to form a fairly complete picture of the manner in which the ice drifts ceaselessly across this basin.

Although, as I say, the assumption of such a drift was at variance with current opinion, something of the kind had already been suggested

in several quarters. I will again refer to the eminent President of the Society, Clements Markham, who, in 'The Report on the English Expedition of 1873-76,' said, twenty years ago, that the water emptied from the rivers of Asia and America into the polar basin "causes a current round the area from left to right, and also across from the eastern to the western hemisphere." As early as 1869 the Swedish naturalist, Professor Agardh, showed that the driftwood of Spitzbergen originated in Siberia. Among the others who made investigations before in the same direction, I must mention Professor Mohr, who, when the articles from the *Jeannette* were found in 1884 on the south-west coast of Greenland, pointed out that they must have drifted straight across the polar basin north of Franz Josef Land and Spitzbergen, and down along the east coast of Greenland.

A thing which caused me most of all to place reliance on a drift of this kind being in constant movement across the polar basin, and to think that it might be turned to account for the purposes of an expedition on the plan that we have carried out, was first and foremost the Siberian driftwood which is constantly brought to the east coast of Greenland, and from the earthy matter to be found everywhere on the drift-ice which comes down along the east coast of Greenland. On microscopic investigation of this mud which I had collected, it proved that it could not well proceed from anywhere else but from Siberia. During our journey we again found, ourselves, the same proofs of the origin of the ice; I found earthy matter on the ice as far north as 86° N., and driftwood likewise. I remember one day far north, during Johansen's and my journey over the ice, our astonishment at seeing a large piece of timber projecting from the ice; it hailed perhaps from the interior of Siberia, and was on its way to the Eskimo of Greenland. The only thing we could do was to cut our initials on it, with the date and latitude, in the hope that it might take a greeting to some acquaintance away in Greenland. We often found similar driftwood in the neighbourhood of the *Fram*. Sverdrup once found a half-rotten piece of timber which was firmly frozen into the ice—this was in April, 1896. When, about a month later, he came across the log again, he was astonished to find that it had been broken off and dragged some distance away. The bears had, no doubt, been amusing themselves by exercising their strength.

But what causes the drift of this ice over this sea? It is first of all the winds. The prevailing winds blow from the Siberian sea towards the north Atlantic Ocean, and they do, in course of time, carry the ice over in that direction. But the winds are, as we know, very irregular forces with which to deal, and in consequence of this the drift is not particularly regular either. Sometimes there are stoppages, sometimes a return drift, sometimes even a drift sideways; but, on the whole, it proved that every time the wind carried us in the right direction—



РЕСЛАВЪ ИС-ОРАТИИОУСЪ, АРЕН, 1903.

towards our goal—the drift became very rapid. On the other hand, if the winds came from the contrary direction, setting us back towards the south-east, the masses of ice were very sluggish and difficult to set in motion; it seemed as if something were keeping them back. As the prevailing winds change very much with the season of the year, our drift was also very periodical.

As a rule the wind was most favourable in the winter; in the summer—particularly the latter part of the summer—it was as generally unfavourable. No sooner were we fast in the ice the first autumn, than we experienced an unfavourable period and were set back towards the New Siberian islands; this was a very dark period in our drift, and everything seemed to go backwards. Then came the winter with good progress, until from June onwards to the autumn of the next year there was again retrograde movement. Then came another winter with good progress, and we gained a point north of 84° N. The summer following this was not particularly favourable either, but the succeeding winter—it was last winter—sent the *Fram* right north again to 86° N. Then came the spring with a long pause in the drift of the *Fram*, until she finally broke loose out of the ice as far north as above 83° N. and made her way down to Spitzbergen—a distance through which no vessel has hitherto broken its way through ice so massive as that which there surrounded her. But, according to my opinion, it is not merely chance winds which influence the drift of the ice; I thought, too, that at times there was evidence of a slight current in the water, under the ice, which also went in about the same direction. Nor do I think that the drift of the ice quite coincides with the direction of the prevailing winds. I had the impression that it often carried us a little further north than did these latter; but our abundant material is not yet calculated out, and before this is done it will not be possible to say anything for certain on the subject.

Our experience with regard to the drift provides a complete picture of how this ice is in continual motion: how there is not a single stationary spot on the whole of this great sea-surface covering the region around the pole. From the whole of this area the winds and the current carry the ice out towards the openings which lead to the Arctic Ocean, chiefly through the large gap between Spitzbergen and Greenland, but also down through the narrower sounds between Greenland and the islands of the North American archipelago. The massive ice-mantle, with which so many of our great polar explorers have sought to cover our pole, has disappeared. Instead of it, we have the ever-wandering ice-fields like a link in the eternal round of nature.

Of the character, formation, and freezing of this ice, our expedition has gleaned valuable information. It would, however, lead me too far away to enter more fully upon this subject, and I will confine myself to the mention of the thickness which this ice attains by direct



CHANNALS IN THE ICE, JUNE 24, 1903.

freezing. As soon as this ice is formed it grows very rapidly, but as the thickness increases the growth becomes slower and slower, as the loss of heat, by radiation during the long winter night, has then more difficulty in penetrating down to the underside of the ice. The ice which was formed in October and November of the first autumn, 1893, had in April, 1894, attained a thickness of $7\frac{1}{2}$ feet, but it continued to increase steadily during the summer. On June 9 it had reached a thickness of 8 feet 3 inches, and this in spite of the fact that there was already a severe thaw on the surface caused by the rays of the sun. On June 20 the thickness was still the same; the thaw on the surface was considerable, and there were large fresh-water pools in every direction. The rest of June the ice continued about the same, until on July 10 it suddenly received a new layer underneath, so that altogether it measured a thickness of 9 feet, despite a decrease by thawing of an inch or two a day on the surface. This formation of new ice on the underside was owing to the layer of fresh water, which, by reason of the surface thaw of the ice, now floated above the cold salt water, the temperature of which was considerably below the freezing-point of fresh water, and which cooled the latter off so effectually that at the line between the fresh and the salt water, at a depth of about 8 feet, a thick layer of fresh-water ice was formed. This lasted through the summer, but then began to decrease slowly—the united thickness of the old layer plus the new layer—until in September the thickness was about $6\frac{1}{2}$ feet. The growth began again in October; on November 10 the thickness had become 6 feet 7 inches; on December 11, 7 feet; and thus it continued to grow slowly during the winter. On February 4 the thickness was 8 feet 4 inches. During the spring the ice went on growing; on May 11, 1895, it had become 9 feet 10 inches: and it was about the same on May 30.

It will thus be seen that the ice does not attain any excessive thickness by direct freezing, and this ice had made the journey from north of the New Siberian islands to the sea north of Franz Josef Land, that is to say, across no inconsiderable part of the polar basin. A floe which was measured the following winter on November 4, 1895, was 11 feet thick; it continued to grow thicker during the course of the winter; and on May 4, 1896, had reached 13 feet 6 inches—quite a respectable thickness when it is a case of forcing a ship into it. But the ice, of course, attains much greater thickness by the constant upheaval from pressure, and it is the enormous piled-up hummocks and rubble caused by this, coming down with the polar current along the east coast of Greenland, which give this drift-ice its character.

The constant pressure to which this ice is subjected gave the expedition a good opportunity of making observations. It proved, as has already been found by several earlier expeditions, that this pressure is dependent in no small degree on the tidal current. This was particularly



OUR WINTER HUT, DECEMBER 31, 1893.

the case on the outer margin of the polar basin in the proximity of the open sea. Thus, for example, the pressure in the ice during the first autumn, 1894, was so regularly dependent on the spring tides, that we could almost say beforehand when it was going to take place. We had two regular recurrences during the month—a period at new moon, when the greatest pressure took place; another period of less pressure at full moon. At these periods the pressure would recur twice during the twenty-four hours, and could be rather violent.

A similar, regular, tidal pressure was experienced by the *Fram* during the last spring and summer, when she had entered the sea north of Spitzbergen; the pressure recurred at such regular intervals that during one week in July, the *Fram* was twice a day gently and steadily lifted up, almost out of the water, by the ice, which then closed together again around her. The pressure was less regular in the interior of the polar basin, particularly during the winter. It sometimes happened, for instance, that when the wind had been blowing for a long time from the south-east, and the ice had got into a good drift in the right direction, and the wind changed suddenly in order to drive the ice into other paths, the latter would, in a way, make resistance by its sluggishness, and violent pressure ensued. The chief mass would come pressing outwards from behind, while other masses of ice further in front were set in motion towards it. If the wind went over to the south-east again, the pressure would cease altogether. It was pressure of this kind to which the *Fram* was subjected at New Year, 1895, and which seemed to have the greatest desire to bury her.

By this movement of the ice, occasioned partly by the tide, partly by these winds, seams and lanes are formed in it, which often run at right angles to the direction of the movement. These lanes often have a great extension, and form large lakes. When, then, pressure suddenly takes place, the ice at either side of these seams and lanes is forced forward, the floes partly under-run each other, are partly piled up in long ridges (*strøgurer*), which consequently come to assume a position at right angles to the direction of the movement. By degrees, as this direction changes, the new ridges cross and recross each other, until the whole surface of the ice is cut up into an intricate network of lanes and ridges, which make progress with sledges and dogs a very difficult matter, as Johansen and I experienced during our journey in 1895.

Investigations as to the temperature and the various depths of the sea-water were made during the entire drift of the *Fram*. As is known, the water which flows from the east Greenland polar current into the Atlantic Ocean is extremely cold to a great depth, and therefore the whole of the north Atlantic Ocean is filled deeply with cold water from the Arctic Ocean of a temperature of 29.3° Fahr. (-1.5° C.). It was, therefore, perhaps to be expected that a similar temperature would be

found in the entire polar basin from surface to bottom. I had, indeed, had my daring doubts of this beforehand, seeing that I assumed the Gulf Stream to enter this basin from several quarters, as I represented at the meeting of the Society before my departure, and I thought that a current of this kind must make its influence felt. Great, however, was my astonishment when, as far east even as the sea north of the New Siberian islands, I found undoubted traces of such a warm current. The surface-water of the entire polar basin is, no doubt, very cold, seeing that it keeps to about the freezing-point of salt water, *i.e.* 29.3° F. to 29.12° F. (-1.5° to -1.6° C.). When, however, I penetrated through this layer to a depth of 200 metres (110 fathoms), I suddenly came on warm water; the temperature of which would be as much as 32.9° , even 33.44° F. ($+0.5^{\circ}$ C. and $+0.6^{\circ}$ C.). At a greater depth the temperature varied somewhat, but remained about the same to a depth of 400 to 500 metres (220 to 270 fathoms), after which it sank slowly towards the depths, though without sinking to the cold temperature of the surface-water. Near the bottom it again rose quite slowly. These conditions were fairly uniform in that part of the sea over which we travelled, and where investigations were made; when I, therefore, give one such series of temperatures from the surface to the bottom, it will be sufficient to characterize the conditions taken as a whole.

TEMPERATURE SERIES, TAKEN AUGUST 13-17, 1891.

	C.	F.		C.	F.
Surface* ...	$+1.92^{\circ}$	$= 35.60^{\circ}$	450 metres ...	$+0.36^{\circ}$	$= 32.65^{\circ}$
2 metres ...	-1.32°	$= 29.63^{\circ}$	500 " ...	$+0.34^{\circ}$	$= 32.60^{\circ}$
20 " ...	-1.33°	$= 29.61^{\circ}$	600 " ...	$+0.29^{\circ}$	$= 32.36^{\circ}$
40 " ...	-1.50°	$= 29.30^{\circ}$	700 " ...	$+0.19^{\circ}$	$= 32.25^{\circ}$
60 " ...	-1.50°	$= 29.30^{\circ}$	800 " ...	$+0.07^{\circ}$	$= 32.12^{\circ}$
80 " ...	-1.50°	$= 29.30^{\circ}$	900 " ...	$+0.04^{\circ}$	$= 31.95^{\circ}$
100 " ...	-1.40°	$= 29.48^{\circ}$	1000 " ...	-0.10°	$= 31.80^{\circ}$
120 " ...	-1.24°	$= 29.77^{\circ}$	1200 " ...	-0.28°	$= 31.50^{\circ}$
140 " ...	-0.97°	$= 30.26^{\circ}$	1400 " ...	-0.34°	$= 31.40^{\circ}$
160 " ...	-0.58°	$= 30.90^{\circ}$	1600 " ...	-0.46°	$= 31.17^{\circ}$
180 " ...	-0.31°	$= 31.44^{\circ}$	1800 " ...	-0.60°	$= 31.00^{\circ}$
200 " ...	-0.03°	$= 31.95^{\circ}$	2000 " ...	-0.80°	$= 30.80^{\circ}$
220 " ...	$+0.11^{\circ}$	$= 32.34^{\circ}$	2600 " ...	-0.74°	$= 30.67^{\circ}$
240 " ...	$+0.20^{\circ}$	$= 32.36^{\circ}$	2900 " ...	-0.76°	$= 30.61^{\circ}$
260 " ...	$+0.34^{\circ}$	$= 32.60^{\circ}$	3000 " ...	-0.73°	$= 30.69^{\circ}$
280 " ...	$+0.42^{\circ}$	$= 32.75^{\circ}$	3400 " ...	-0.60°	$= 30.76^{\circ}$
300 " ...	$+0.34^{\circ}$	$= 32.60^{\circ}$	3700 " ...	-0.65°	$= 30.81^{\circ}$
350 " ...	$+0.44^{\circ}$	$= 32.80^{\circ}$	3800 " ...	-0.61°	$= 30.85^{\circ}$
400 " ...	$+0.35^{\circ}$	$= 32.63^{\circ}$			

These water temperatures are remarkable in several ways. First, the temperature, as it will be seen, sinks from the surface down to 80

* Two metres are equal to about $1\frac{1}{3}$ fathoms. Roughly, metres may be converted into fathoms by dividing by 2.—*Ed. G. J.*

metres; it then rises till a depth of 280 metres is reached; sinks again at 300 metres, and again rises at 325 metres (where it was 32.88° F. = $+0.49^{\circ}$ C.). It then sinks to rise again at 450 metres, then sinks steadily down to 2000 metres, and rises again slowly towards the bottom. Similar risings and sinkings were found in nearly all the temperature series, and the variations from the one month to the other were so small that at the different depths they often only amounted to a couple of hundredths of a degree. Sometimes, however, the temperature in the warm-water layers would rise higher even than is here given. Thus, on October 17, the temperature at a depth of 300 metres was 33.32° F. = $+0.55^{\circ}$ C.; at 350 metres, 33.36° F. = $+0.70^{\circ}$ C.; at 400 metres, 33.40° F. = $+0.75^{\circ}$ C.; and at 500 metres, 30.11° F. = $+0.62^{\circ}$ C., after which it sank gradually until towards the bottom it began to rise again as noted above.

I have now mentioned most of what it is possible for me to enter upon here. There is still a great deal which ought also to be noticed, but this does not lend itself to discussion at present, as the material must first be worked out. This is particularly the case with the meteorological observations, which, being extended over a period of three years, will afford a valuable contribution to the understanding of the climatic conditions of these regions. I can, nevertheless, say as much as that our observations did not bring to light any meteorological surprise, as did those on our expedition across the "inland ice" of Greenland. The temperature seems to be distributed over this sea in about the same manner as might be assumed beforehand; and when, in setting forth my plan of the expedition, I represented that the winter temperatures in the unknown polar sea would probably be found to be higher than those of Siberia, for instance, I was correct. The sea seems to make its presence felt here, and our lowest temperatures (-52.6° F. = -52.6° C.) were not immoderately low, when it is remembered that in Verkhoyansk, in Siberia, which is inhabited, temperatures as low as -90° F. = -68° C. have been registered.

The weather in the winter up there was unusually clear, and often for a long time together there was not a cloud in the heavens. In the summer, when there were open lanes and the snow melted on the floes, there could, however, be much mist, even in the interior of the polar basin. On the whole there seems to be much equableness in this atmosphere, and the winds were not particularly strong: they seldom amounted to what we should call a gale here. This was most apparent in the eastern part of the polar basin; but by degrees, as we approached the Atlantic and the parts between Spitzbergen and Greenland, there was a change in this respect, the winds sometimes blowing with much greater violence. There was, however, a conspicuous difference, on the whole, between the winds and the climate in the north along the *Fram's* route in the drift-ice, and the climate which Johansen and I experienced.



during our winter in Franz Josef Land. If in the north, in the long still winter night, there had been a remarkable quiet and equableness, the reverse was now the case. Storms howled round us continually. Matters came to such a pass that one day the wind even carried away Johansen's kayak, and we nearly lost it altogether in the darkness. Another day my sledge went off. A third day a ski, which was standing up in the snow by the side of the hut, had the end blown right off; and although the temperature in Franz Josef Land was very much milder than that we had experienced north in the polar basin, yet it cannot be denied that now and then we both longed for the profound stillness we had left behind.

We had unusually good opportunities of observing the northern lights, and they were exceedingly frequent. I think I may say that not a single night or day passed during the winters up there without the aurora being seen, provided the weather were clear enough for it. Furthermore, I must mention that it appeared to me that the sky was always covered by a faint even veil of light, which, as far as my spectroscopic investigations could determine, seemed to be a constant aurora-veil. This veil was thick enough to almost hide the Milky Way, so that we could never discern it with certainty. On the whole I received the impression that the aurora-belt which surrounds the pole extends, on this side, a good deal further north than is generally supposed. I also made observations with regard to the electricity of the atmosphere. This seems to vary very much, and at times was considerably greater than has generally been supposed; at other times it was quite difficult to show any trace of electricity. Lieut. Scott-Hausen made a long and valuable series of magnetic observations during the three years. It is to be hoped that when this material has been worked out, it will afford valuable contributions to the comprehension of this difficult subject.

With regard to animal life in these parts, there is a good deal that is new to be told, which space, however, does not admit of. There were naturally numerous animals, particularly crustaceæ, in the sea, even in the highest latitudes. As a remarkable fact in this respect, I must mention that even north of 84° N., and near 85° N., schools of narwhals were observed near the *Fram*—a proof that they must be able to find sufficient nourishment in this sea. Seals were frequently seen in the summer, and the first winter I even came across a walrus in the middle of the sea between the New Siberian islands and Franz Josef Land. What it was doing there is still a puzzle to me. Bear were shot on board the *Fram* north of 84° N., and Johansen and I saw the tracks of foxes in 85° N. It will be seen by this that even mammalian life exists very far north on our globe, and it may even reach the pole itself. We saw birds every summer. I think I have made quite an interesting discovery in the number of the mysterious Ross's gulls, or

roseate gulls (*Rhodostethia rosea*), that we saw on the north side of Franz Josef Land, near the islands discovered by us, i.e. Hvidten Land. They were so common that I have no doubt whatever that they have breeding-grounds in the neighbourhood. Unfortunately, time did not admit of our investigating this further. On board the *Fram*, too, we shot several specimens of quite young birds of this species in their hitherto unknown garb.

While speaking of animal life in the far north, I ought perhaps to mention the vitality I found in the summer in the pools on the drifting ice. As soon as the summer sun is able to melt the snow off the ice in these parts, a comparatively rich plant and animal life begins to develop in the fresh-water pools caused by the thaw on the surface of the ice. They look like brown patches and accumulations, and might easily be taken for mud, but under the microscope they reveal themselves to be pure vitality—chiefly minute plants, diatoms, and some algae. But among these there also exists a crowd of tiny microscopic animals—infusoria—and I also discovered small bacteria, so that even these regions are not free from this noxious animal. It is a remarkable proof, in my eyes, of the fruitfulness of Nature; even on this ice she finds conditions for the calling forth of life.

Before concluding this paper, I must point out what suggestions the expedition may possibly afford to the future exploration of the regions of the polar sea which are still unknown. First of all, I think, the expedition has clearly proved the efficiency of the mode of travel which we adopted. That a ship can be built able to withstand the pressure to which it would necessarily be subjected on a drift through these regions, I think we have proved. It can hardly be doubted that the *Fram* was exposed to difficulties of this kind as great as can reasonably be imagined. Worse pressure than that we had in January, 1895, I, at any rate, have never heard of. The *Fram* was at that time beset in ice over 20 feet in thickness; the temperature was very low so that the ice was about as hard as it could be, and during the pressure a prodigious ice floe overran the thick floe in which the *Fram* was beset with tremendous force against her port side. For the first time the *Fram's* timbers creaked and groaned; it seemed almost incredible that human work should be able to withstand where such stupendous forces were set in motion. But the *Fram* held her own, broke loose from the ice, and rose slowly from her icy bed without a hint of damage in any part of her. I infer from this, and several similar experiences, that the polar sea can be traversed with reasonable safety in the manner we adopted, if only proper provision be made. One is exposed to dangers, of course, though they are not so great as those entailed by many other modes of travel; and given this to be the case, then I think this manner of travelling offers such great advantages that it is quite warrantable, and ought to be adopted in the future,

seeing that a ship drifting like the *Fram* through unknown regions affords the best means of making scientific investigations of all kinds. It is only by a sojourn of years that sufficient material can be collected to enable a fully satisfactory conception of the physical conditions of these regions to be formed. In a vessel like the *Fram*, it would be possible to take on board with one laboratory where even the most elaborate scientific investigations could be made. Could an expedition of this kind go north through Bering Straits and enter the ice thence in a northerly, or perhaps north-easterly direction, I think it would bring with it, when it eventually emerged into open water on this side of the pole, a sum of information which would quite put the *Fram* and her men in the shade.

But such a drift would take a longer time than ours did, and, many people might urge in objection, would expose its members to certain dangers, as it is stated that a sojourn of years in these parts would be injurious to health. I cannot, however, agree in this. From my experience, I must say that I found the arctic regions a very healthy place of resort, and as a proof of this I may mention that when I returned from wintering on Franz Josef Land I was stouter than I had ever been in my life before. On the trip from the *Fram* to Jackson I gained no less than twenty-two pounds in weight. Something of the same kind was also my experience when on board. As far as I could see, the rest of the party were perfectly well, and the physiological examinations which were made on board seemed to point in the same direction. This may be very important material for coming expeditions, and will throw light on the hygienic conditions during our expedition; but, unfortunately, the material is not sufficiently worked out to allow me to set it forth here. I dare only say that the malady which has hitherto been feared more than anything else in arctic exploration ought not to occur again, as it is undoubtedly very easily avoided when proper precautions are taken.

Dr. Torup, professor of physiology at the University of Christiania, has come to the conclusion, after examining the subject, that scurvy must arise from poisoning, caused, in particular, by badly preserved meat and fish. He thinks that in the decomposition which takes place in the meat from bad preserving—in salt meat, for instance—there is poisonous matter allied to the so-called ptomaines, which, when constantly partaken of, engenders the malady we call scurvy. Particular attention was paid to this at the time of our equipment, and from our experience and the investigations I had the opportunity of making during our journey, I can entirely subscribe to Torup's opinion in this matter. It is to be hoped that in a near future there will be scientific elucidation of this important point; and it is equally to be hoped that certain means for avoiding this hitherto so fatal disease may be shown.

Another thing with regard to the mode of investigation of the arctic regions which our expedition learned was perhaps this—that even with small means good results can be obtained. By acting on the hints given by the Eskimo, and pushing forward with “kayaks,” sledges, and dogs, one is enabled to penetrate into and cover considerable distances in regions which have hitherto been considered very difficult of access. In this way the drift-ice itself can be travelled over at a considerable distance from land—even where it is in motion; and I think this must be one of the ways in which it should be endeavoured to investigate the great unknown region between the North American arctic archipelago and the pole. Here, no doubt, many interesting problems are awaiting their solution. May a not far-distant future see those tracts traversed by human feet?

THE NORTH POLAR PROBLEM.*

THE PRESIDENT: When Dr. Nansen was so good as to read us the interesting account of his expedition last month, owing to the peculiar circumstances of the occasion we were unable to take the usual discussion of the paper at that time. I therefore propose that we should take it this evening, and I shall read a short paper intended as a hook upon which the discussion may be hung.

It has taken centuries to obtain even a very general idea of the north polar region. Three centuries ago Mercator adopted the theory, which was derived from the mysterious Nicholas of Lyne, that four great rivers flowed down a chasm at the pole. Later there was Maury's theory of an open polar sea; and the most recent opinion that has prevailed was that the polar sea was shallow, with land, in the form of islands, extending north from Franz Josef Land.

Facts could not keep pace with theories, but they have gradually and painfully refuted them, and revealed to us the truth. It has long been known that a great stream of heavy ice flows down the east coast of Greenland. The archipelago of ice-capped islands, known as Spitsbergen, had its general outline made known by British seamen 270 years ago; and more recently it has been ascertained that the sea to the north of it is of great depth; while warm currents, proceeding from the Gulf Stream, flow up the Spitsbergen western coast, and eastward to Novaya Zemlya. The coast of Siberia was also known to be bordered

* Report of a discussion at the Royal Geographical Society, March 22, 1897. Map, p. 588.

by a sea of comparatively light ice, with frequent *polynias*, or pools and lanes of water, described by Wrangel, even in the winter.

The American side of the polar sea was gradually discovered to be of a very different character. Collinson found that very heavy ancient ice formed the pack from Bering strait to Franklin bay, only a narrow lane being kept open by the current of the Mackenzie and Colville rivers, between the land and the pack. McClure discovered that the same ancient ice extended along the whole western shore of Banks island. The surfaces of the floes resemble rolling hills, caused by the accumulated action of repeated thaws and the almost constant fall of snow on the upper surface, giving it a peculiar hill-and-dale appearance. Mechem found the same ancient ice along the western shore of Prince Patrick island. He described it as "tremendous," and he came to the conclusion that the sea on which it floats was of great extent. Parry met with this ancient ice when he attempted to go westward from Melville island, and it flows down McClintock channel south-east until it impinges on the coast of King William island. This stream was met with by Sherard Osborn and Vesey Hamilton on the western shore of Prince of Wales Land; and it stopped the progress of Sir John Franklin's ships to the American coast. Sir George Nares's expedition met with the same ancient ice extending for 300 miles along the northern coasts of Grant Land and Greenland. It was found to consist of small and rugged floes, separated by ranges of hummocks, from 30 to 50 feet high. The surfaces of the floes were studded over with rounded blue-topped ice-humps, the depressions between them being filled with snow, deeply scored into ridges by the prevailing wind. Every indication pointed to the conclusion that there was no land to the northward. But the sea was supposed to be shallow, because there were only 72 fathoms of water at a distance of 40 miles from the shore, and because the positions in which driftwood was found furnished an argument that there had been a general recent upheaval of the adjacent land. Huge masses of grounded ice, along the shore, were believed to have been broken off from large floes of ice, and were called "floe-bergs." The floes themselves are of enormous thickness, formed by continual accumulations from the annual snowfalls, which, by the increasing additions from above, are gradually converted into snow-ice. The process of formation of this ancient ice thus resembles that of glaciers, and the ice broken off from it has all the character of icebergs. It is deduced, from similarity of tides, direction of prevailing winds, and movements of the ice, that the line of ancient ice continues south-west to Prince Patrick island. The same reasons exist for the belief that Greenland does not extend far to the north, and this view is also confirmed by Prof. Houghton's study of the tides. The ice is subject to annual disruption during the summer months, and is in motion, driving backwards and forwards with the winds and currents, its main course being towards the east.

We thus find that this line of ancient ice extends from Bering strait to the north coast of Greenland, a distance of 1200 miles, for that it is continuous across the gap of 400 miles between Prince Patrick island and Aldrich's farthest is deduced from the coincidences of winds, tide, and drift. The fact that the heavy ice actually reaches the western part of the North American coast seems to indicate that there are no intervening lands, of any extent, to the westward of Prince Patrick island.

The discovery of Franz Josef Land brought to our knowledge a group of volcanic islands of the same geological period as Spitsbergen, approaching Spitsbergen closely at its western end, and on the same bank; in short, a continuation of the Spitsbergen group. Beyond this bank, the European polar sea was found to have a depth of 2000 fathoms south-east of Jan Mayen, 2650 fathoms between Spitsbergen and Greenland, and 1370 fathoms north of Spitsbergen. It was a correct deduction to assume that to the north of Franz Josef Land, which is but a part of the Spitsbergen group, there is the same deep polar sea.

There is an eastward drift of the ice on the coast of Grant Land; and it was assumed that there was a general drift of ice across the polar basin from the eastern to the western hemisphere, as well as a drift from left to right, due to the flow of warmer water into the polar area, which, as a cold current, seeks an outlet southward at every opening, owing to the polar area itself being surcharged, but only finds it for the ice it bears on its surface along the east coast of Greenland. The warmer water comes to the surface along the Siberian coast, and, aided by the outflow of the Siberian rivers and the prevailing winds, forms a current northwards across the polar area.

These were the conclusions which were derivable from the facts within our knowledge before the departure of Dr. Nansen. His return, with the rich fruits of his expedition, has thrown new light on the whole question, and, as I said on a former occasion, the north polar problem begins to take definite shape. Nansen's chief discovery is that there actually is a very deep sea north of the Franz Josef group, continuous with that which was known to exist north of Spitsbergen, and that this deep sea has a relatively warm temperature in its depths. He ascertained that the time occupied by the ice, in drifting across the polar basin on the parallels of the track of the *Fram*, is a little over three years, and that the ice-bearing ocean extends at least as far as the pole. For the *Fram's* track southwards to Spitsbergen leaves a great width thence to Greenland, down which a vast volume of ice drifts, which must necessarily come from a region north of the track of the *Fram*.

The question remains to be decided whether there is land of any extent in the vast unknown region between the Parry islands and the

New Siberian group. At one time I held the opinion that a chain of islands probably did exist, extending from the neighbourhood of Prince Patrick island towards Wrangel island. This opinion was solely based on considerations connected with the apparent line of Eskimo migration from Melville island to Greenland, as indicated by a continuous series of remains. But I now concur with Dr. Rink that these vestiges are due to visits from the American continent in times past. The presence of the ancient floes of heavy ice along the north shores of the American continent is evidence that no land of any size exists to the northward, on the meridians from Bering strait to Franklin bay. In fact, I am disposed to regard the whole line of heavy ancient ice which presses upon the shores of the American continent, of the Parry islands, and of the northern side of Greenland as evidence of a continuous drift from the eastern to the western hemisphere, across an ocean uninterrupted by land of any magnitude.

The presence of warmer water in the depths of Nansen's polar sea is an important discovery. It commences 100 fathoms below the surface, and extends down to 250 fathoms.* If this warm current originates in that which flows up from the North Atlantic, Prof. Mohr has observed that its greater salinity, and consequent greater density, would keep it in the depths when it cools down, while the water from the great rivers would be much lighter, and continue on the surface. But there are, I believe, other opinions respecting the origin and eventual destination of this warmer undercurrent in the polar ocean, respecting the part it plays in the economy of that ocean, and respecting the causes of its long retention of some of the warmth derived from the equator.

The study of the currents, and still more of the meteorology of the polar ocean, as observed on board the *Fram*, will certainly throw further light on the polar question, for the observations are continuous during three years. Moreover, they cannot fail to have a practical bearing on atmospheric problems further south, and to increase our knowledge of the causes which influence meteorological changes. Much importance must also be attached to the magnetic observations taken by Lieut. Scott Hansen, after receiving instruments and instruction from Prof. Neumayer, of the "*Seewarte*" at Hamburg. Our knowledge of terrestrial magnetism is very incomplete, especially as regards the polar, and more particularly the south polar, region. Apart from the practical importance of the magnetic observations, it may well be that the curves of inclination, when plotted, may, with reference to points of greatest intensity, indicate the presence or absence of land over parts of the polar area.

The distribution and limits of animal and vegetable life is another help to a solution of the problems connected with the polar region.

* Surface, -1.6° C. (31.70° Fahr.); 100 fathoms, $+0.8^{\circ}$ C. (33.44° Fahr.)

Diatomacées and other minute organisms are reported to be abundant, but the larger forms of animal life appear scarcely to exist on the sea of ancient ice. Nansen's expedition only saw little auks which live in the lanes of water formed by the drifting ice, and a few dovekeys, and the only cetaceans were narwhals. Yet wherever there is land the land-arctic forms are met with, and the absence of flights of land-birds, such as Brent geese, to the northward, is an indication of the absence of land. The great polar sea is probably a sea without islands, and if so, it is a sea of solitude.

Looking back into past ages, we may discern the evidence of great changes in the polar area, as throughout the Earth's surface. The Spitzbergen archipelago, including Franz Josef Land, seems to be the broken fringe of a continent which, in the Jurassic age, was clothed with pine forests. At a still later period there was abundant arborescent vegetation in Grant Land, and it is probable that the conditions within the vast area of the polar ocean were then very different. From a geological point of view, there is much food for reflection, based on the knowledge we already possess respecting the north polar region; and much further research is needed, especially with regard to the upheaval of the land, which is reported from so many directions. A geological point of special moment is the extent to which the polar phenomena of an extensive land mass in the south, and a deep ocean in the north, are illustrative of and explicable by the theory of earth-folds.

In reviewing the whole polar question, it will be seen that great progress had been made towards its solution, in various directions, before the departure of Nansen's expedition, but only fragmentarily and by side lights, while even the collected facts were often misinterpreted and misunderstood. I consider that the light thrown upon it by Nansen has not only extended our knowledge positively, but has had the effect of piecing together what appeared before to be fragmentary, and of making the detached pieces fit into their proper places and form a consistent whole. There is much, no doubt, that needs discussion and a free interchange of opinions, both on the broad aspects relating to the physical geography, and to the special subjects of oceanography, meteorology, terrestrial magnetism, biology, and geology, on which I have touched very briefly.

There is, however, still much to learn. An expedition should be sent up Jones sound to connect the 400 miles between Prince Patrick island and Aldrich's farthest, and to examine the line of ancient ice in that unknown region. Another expedition should complete the examination of the northern side of Greenland. A third should be equipped on Nansen's plan, and sent to carry out Nansen's principle, by commencing the drift much further to the eastward, and passing over the pole itself. This would probably occupy four years, but it would bring back a further instalment of knowledge respecting the depths of the ocean

the currents and temperatures of the vast unknown area, and another series of magnetic observations. It should also decide the question of the existence of land between Prince Patriok and Wrangel islands.

It is true, therefore, that much remains to be done. Still, we already have a large mass of facts respecting the polar region, from which scientific deductions may be drawn, and this has been enriched and materially increased by the labours of Nansen and his gallant companions. On the various points of scientific interest which I have very briefly enumerated, I would now invite discussion; for such an interchange of impressions made on the minds of trained scientific men by the facts brought home by explorers, is of incalculable advantage in the prosecution of further research.

Dr. NANSEN: I must first express my great pleasure at being asked to speak on this occasion. I can assure you I feel highly honoured at being allowed to open the discussion on this most interesting paper by our distinguished Chairman.

It is very difficult in a few words to point out what may be of importance to discuss in a subject of such vast bearing. I shall, however, first only speak about those points which I think may be of most importance in connection with our expedition. I think that of specially great interest is what we have found as to the extension of sea in the north polar regions. We have seen that the whole sea to the north of Siberia is a very deep basin with comparatively warm water. We have seen that the sea-basin of the north polar region is only a continuation of the deep basin stretching northwards between Spitsbergen and Greenland, as our President has already pointed out. We knew before that for some distance north we had deep water. On the other hand, we knew that the depths to the north of Siberia and America were very small—80 fathoms at the greatest. Now we have seen that this deep sea-basin stretches eastwards as far as the New Siberian islands. All this part of the north polar sea is deep sea, averaging 2000 fathoms deep, and of course you cannot expect this sea-basin to stop here. We may expect it to stretch further eastward—as we see from the route of the *Jeannette* that the sea was getting deeper to the north very quickly: in a short distance it grew from 40 to 80 fathoms. Consequently, I believe we may consider the whole sea to the north of Siberia to be one extended deep sea-basin. I think we can with great certainty say that the pole itself must be situated in this sea-basin. If the *Fram* had not worked herself southwards out of the ice, it is quite certain she would have drifted further in a south-westerly direction along the coast of Greenland. But we could not expect to have got quite close to this coast, as, if the direction of the drift had continued, she would have come southward nearer to the outer margin of the current. Then there would have been a broad current of ice running out from the polar sea

between the probable route of the *Fram* and the east coast of Greenland. All this ice must come from some part of the polar sea north of the route of the *Fram*. It is, in a way, the same condition as we have with the great inland ice of Greenland, which has a great inner basin of heaped-up snow year after year, and all this must have some outlet somewhere. The inner ice of Greenland finds its outlet through the ice-fiords where the icebergs are produced. In the same way we may consider the polar ice in the polar basin; it must have an outlet somewhere, and the only one of importance is the one we have by Greenland; therefore most of the ice produced over this area is probably forced by wind and currents out this way. Some part of it is also pressed against the coast of America, and out through the sounds in the American archipelago. Now, it is evident, if the *Fram* had come down by the coast of Greenland, there would, as I have said, been a belt of ice between her and the coast; this ice must, however, represent an extended area to the north from which it originates; for the current runs at much greater speed in the south than in the north. It will consequently be much broader in the north, and probably will go beyond the pole. I think this one of the best evidences that the sea also has a great extension to the north. There were also others, e.g. the drift-ice always easily drifted northwards. The most difficult direction to drift in was constantly in a south-easterly direction; but it always went on easily in a north or north-westerly direction when the wind began to blow from the south or south-east. This proves there cannot be much land to the north, because if there were extensive land it must stop the drift of the ice in that direction. It also seems, according to the experiences and observations during Johansen's and my sledge journey, that the ice drifted with more speed in the north than in the south. It was more broken up; there was more motion between the floes, and in the water channel the current was often running pretty hard.

As the President has already mentioned, no land-birds were to be seen flying northwards. This also indicates the absence of land to the north, for if there were land there would probably be land-birds of some kind. We don't know any land yet where there are not birds.

I agree with the President that the polar ice seems to prove there cannot be much land to the north of the North American archipelago. I think it is probable we may find some islands; but land of great extent cannot easily exist between the islands we know and the New Siberian islands.

I should like to hear Admiral Sir George Nares's opinion about the great palæocryatic ice north of Greenland. I have some doubt whether that ice is really polar or sea ice; whether it is not glacial ice coming from some of the glaciers of Greenland or Grinnell land. The only difficulty would be if the ice Albert Markham met with during his journey is of the same description, because it would be difficult to make

the glacial ice drift far out to sea. The layers described by Dr. Moss makes it in my opinion probable, or at any rate possible, that it is glacial ice, because I believe it difficult for the real sea-ice to remain for such a long time as to obtain so many layers as seem to have been found. Sir George Nares would be able to give a better opinion on that ice than I could; however, if it is sea-ice, that may prove, I think, that there are islands in the north where the sea-ice can be closed up for some time in order to get these layers of snow heaped up annually on it. During the drift this stratified ice can hardly be formed, as I don't think the ice would take so long to drift across the polar region that many layers could be formed; the oldest ice we saw during our journey—and we saw some old ice—I should not think would be more than five or six years old, at all events.

The ice we saw was on an average, I should say, about 10 to 12 feet thick, and I don't believe that polar ice in the open sea will, as a rule, freeze much thicker. I paid much attention to the thickness of the ice at various seasons of the year. The ice formed in October and November, 1893, had next spring, in April, 1894, reached the thickness of 7½ feet, but it continued to increase steadily during the summer, and on June 9 it had reached the thickness of 8 feet 3 inches; and this in spite of the fact that the ice was now melted on the surface by the rays of the sun. On June 26 the thickness was still the same; the thaw on the surface was considerable, and there were large fresh-water pools in every direction, but the ice was being constantly formed on the under side in spite of this. The rest of June the ice continued about the same, until about July 10 it suddenly received a new layer underneath and became 9 feet thick. This increase I understood to be owing to the layer of fresh water which during the summer was swimming on the cold salt water underneath; at the depth where this fresh water touched the very cold salt water there was therefore formed a thick layer of fresh ice. This made the floe-ice considerably thicker. However, as the autumn approached the ice would decrease in thickness, but next winter it would continue to grow again slowly. On December 11 the thickness was 7 feet; on February 6, 1895, the thickness was 8 feet 4 inches. During the spring it went on growing, and on May 11, 1895, it had grown to 9 feet 10 inches, and it was about the same at the end of May. This was the thickness of the ice arrived at during more than one and a half year. We made some other measurements. The greatest thickness that we found the ice actually reached by freezing without being piled up was 13 feet 10 inches; this was in May, 1896, and probably after four years' drift in the sea. I think it may be that ice stopped by land and kept there for years might form thicker, but the warm water underneath would prevent the growing of ice to a certain extent. When it has reached a certain depth, it cannot form any thicker. There is sufficient heat

to prevent the formation of ice on the under side, but by the piling up of the ice much thicker floes will of course be formed.

I mentioned the water temperatures; I think they are also interesting, and will give you a few taken at various depths. Excepting the sea near the coast of Siberia, where of course the conditions are altered on account of the shallow water and the currents running along the coast, we find almost everywhere the conditions of the temperature pretty constant, almost the same month after month and year after year. Of course there were variations, but so small that they are not of sufficient importance to be mentioned here. I will take one series of temperatures obtained in August, 1894.* Now, measuring by Centigrade thermometer, it would be on the surface 1·9 above, but at 2 metres' depth the temperature sank down to $-1\cdot3$, very near the freezing-point of the salt water; at 20 metres it was the same as at 40 metres, $-1\cdot5$, about the freezing-point of salt water with that salinity. The same temperature is found down to 100 metres, where it begins slowly to rise again, and is $-1\cdot4$. Then it would rise slowly downwards; at 140 metres it was about -1 below freezing; at 200 metres it would be $-0\cdot03$; then at 220 metres it rose above freezing-point, $+0\cdot19$. Deeper the temperatures did not alter quite regularly, sometimes lower, sometimes higher again, showing that the currents must be running underneath. At 280 metres it was $0\cdot4$ above, and 300 metres $0\cdot3$, consequently lower again; at 350 metres it would again rise to $0\cdot4$, and then it would go on above freezing-point until 800 metres was reached, where $0\cdot07$ above freezing was registered. Then it gradually sank; at 1000 metres it was $0\cdot1$, and at 2000 metres it would be $-0\cdot6$; at 3000 metres it would be $-0\cdot7$. It sinks very slowly, but never reaches the freezing-point of salt water. When approaching the bottom it slowly rises again; at 3000 metres, $0\cdot73$; at 3400 metres it would be $-0\cdot60$; at 3700 metres, $0\cdot65$; at 3800 metres, $-0\cdot64$; the bottom was about 3850 metres deep. The main features found everywhere were, on the top a cold layer of water about 200 metres in thickness, or 100 fathoms; then the temperature of the water rose above freezing-point, and kept that down to 300 metres, or 500 fathoms; then it began to sink, and rose again when it touched the bottom. This same feature was repeated time after time, and the temperature in various months was so nearly the same, that it did not differ more than some few hundredths of a degree. This relatively warm water must be Atlantic water that runs into the polar sea as warm surface currents, branches of the Gulf Stream running northward along the west coast of Spitsbergen and eastwards to the north of Novaya Zembla. I believe that they run into the polar basin and fill the whole depth with this comparatively warm salt water, whilst the surface of the polar sea is formed by colder water with

* See table, p. 469.

less salinity, which is, of course, produced by the rivers that run into the polar basin, especially from Siberia.

I think these were, perhaps, the most important geographical and oceanographical results of the expedition. The drift of the ice, as you will have gathered from what I said in the Albert Hall, was mostly produced by the winds. The prevailing winds will produce a drift, or a current of ice if you will call it so. I dare not say yet whether there were other currents underneath. We have to work out the average directions and speed of the wind, and then work out the various observations as to the currents made by the help of constructions we sunk down into the water, before anything can be said with certainty on this subject.

The best period for our drift was winter and spring, and the worst period would be, as a rule, the summer and the beginning of the autumn. During that time we were stopped or drifted backwards; with the late autumn we drifted on again, and during the winter, as a rule, we had a fairly good drift, except during the last spring, when the *Fram* was stopped by southerly winds, until she at last got favourable winds and drifted on again. I quite agree with the President, that what now ought to be done in the arctic regions is especially the exploration of that part of the polar area to the north of the North American Archipelago and the north part of Greenland; but, as the President said, I think also that the same principle we made use of, to drift with the ice, ought to be tried once more. I think, if the expedition were as well prepared as we were, and went north through Bering straits, not so much to the west as the *Jeannette*, you would get another drift straight across the polar region, and that would probably last five years, and during these five years there would be excellent opportunities to take scientific observations of all kinds. I think what we really want is scientific observations from the arctic regions. Of course, in a shorter expedition with sledges some explorations can be done, and I do not think it is difficult to reach the pole in this way. If you care for it, you can easily do it with dogs; it is only a question of dogs. I am doubtful, however, whether it is worth while. You do not bring back sufficient observations to pay for the waste of time and labour; but we want scientific observations, and to get these, I can assure you there is not a better plan than that on which we worked—to go with the ship into the ice. It will give you the most excellent observatory you can wish for; you can have all kinds of laboratories on board, even much better arranged than they were on board the *Fram*, and if a man would spend five years over it, he would bring back observations that would pay him many times; he would then have rich material with which to form a clear and adequate idea of the physical conditions in the north polar region, and that is what we want.

THE PRESIDENT: We have the great pleasure of welcoming Sir Joseph Hooker here this evening, and as he is a veteran who was studying

polar subjects and battling with polar ice thirty years before Dr. Nansen was born, I venture to request him to continue the discussion.

SIR JOSEPH HOOKER: It would give me very great pleasure if I could say anything that would throw any light upon this discussion. I certainly should have thought myself the last person to be called upon so early to speak on the subject. Of course my speciality is botany, and you would expect to hear from me something connected with the flora of these lands and countries, and how far the further exploration which your President supports is likely to throw any light on that branch of science. Now, I must confess I am in some difficulty, because the interest of botany in these regions is comparatively scanty; it is, however, threefold. In the first place, there is the existing flora, the flowering plants with which we are most familiar. Now, I don't think further exploration of the polar region will add much to our knowledge of that branch of botany. We pretty well know what the plants are, and don't expect any addition to our knowledge in that respect, nor their geographical distribution. It is further established that the arctic flora is divided under three groups—Asiatic, European, and American—that are slightly different from one another. These groups have been pointed out and pretty well limited in each direction. We don't expect the individual species to extend much further north than they have been found to do, and if they do, it can only be in respect of a very few species; and as we advance further into the polar area, we find ourselves in the position of the poor professor who had to lecture on the snakes of a certain island, and commenced his lecture by saying, "There are no snakes on this island." The two other divisions are of vast interest and great importance. One of these is the fossil flora. We know from repeated observations that, as your President pointed out, large floras are locked up in the geological formations of high northern regions. They occur in Skye, where fossil leaves are found in beds of trap. They are found in abundance in Greenland, and again in Spitzbergen. Now, that is a botanical subject of the greatest difficulty, because the plants occur only in a fragmentary condition, and it requires great skill and knowledge and a number of specimens to exactly ascertain what they are. What they have certainly proved is, that they are indications of a warm temperature having prevailed over these regions. Now, a further exploration may lead us to hope that more land will be found in the polar area in which these plants may be embedded, and which would therefore give us a vast extension of our knowledge of what the flora must have been in former days, and an increased number of specimens to certify the knowledge we have already.

The third point to which I have to draw your attention is the existence of that microscopic flora and microscopic fauna that swarm in the polar sea; of those plants especially which, being coated with silica, are absolutely indestructible, and, falling to the bottom of the sea,

form vast beds of what is practically Tripoli stone. Now, I am not aware of any beds of that description being found in the northern seas, but in the southern they extend along the shores of Victoria Land at a depth of 200 fathoms, as beds of silicious mud capable under pressure of forming Tripoli stone. Beyond this I don't think I have anything further to say, but may touch on one subject, which is a difficult one. I should like to know whether any observations were made during the expedition of the *Fram* on evaporation from the ice, and on the extent of loss by such evaporation. We have been told that where large masses of snow accumulate, they are carried off by floes in one case into warmer waters, and in the other in the form of glaciers. I have been led to doubt whether these sources account for the enormous waste of ice that goes on in the polar regions, and should be glad to know whether any observations of this subject were made by Professor Nansen.

The PRESIDENT: I don't know that any one can impress upon us the practical value of polar research better than Prof. Rücker, with regard to magnetic observations.

Prof. RÜCKER: I hardly expected to be called upon so early in the evening, because, although not wholly a laboratory worker, I have had no personal experience of expeditions which can be compared with that which has been described by Dr. Nansen; but, at the same time, there can be no doubt that the interest of this expedition very largely centres about the magnetic work done, and I hope, when the various observations of Dr. Nansen and his friends have been worked out, something of interest may be added to our knowledge of magnetism. Perhaps it would be well to preface these remarks by a word or two on observations of this sort. There is no doubt that the whole subject is one of the most mysterious with which science has to deal, and we have at present very little knowledge as to the cause of the phenomena we observe. The time is now coming when the facts will be regarded from a wider point of view than that adopted a few years ago.

We now have sufficient knowledge of the magnetic state of the Earth to be able to draw fairly accurate magnetic maps, and, by the methods originally devised by the mathematician, Gauss, to get some idea of the magnetic state of the world as a whole. Instead of concentrating attention upon the more or less fictitious poles which the magneticians of the past were so fond of, an attempt is now being made to break up the forces into various groups, and to separate the great group of forces which represent the Earth's magnetism parallel to one axis, from others which may perhaps represent the disturbing influences. Then follows one of the most interesting questions which next century will solve. Is it possible that these groups of forces represent those portions of the magnetism of the Earth which are respectively at rest and stationary? to picture the state of the Earth as partly due to permanent magnetism,

and partly to superimposed and moving magnetism which disturbs the simple results due to the first cause? If this were possible, if we could represent the Earth so, then a very great step would be made in the theory of terrestrial magnetism. It is to further observation that we must look for a solution of this problem, and, in order to solve it quickly, it is necessary that these observations should be well distributed over the Earth.

Dr. Nansen's expedition will, no doubt, have done a great deal in adding to our knowledge of the magnetic state of the north polar area, but one point has not been referred to which leads us to hope that the observations may be of a very high order of accuracy indeed. The land often produces a very great effect upon the needle, but Dr. Nansen's observations have been made, not only on non-magnetic ice, but on a vast depth of non-magnetic water, and therefore the disturbing causes which are so troublesome on land will be absent. Turning next to the meteorological conditions under which the observations were made, I can only say that I have myself made many magnetic observations under the comparatively small variations of temperature which we suffer from or enjoy, the heat of summer and the cold of winter. I know what the difficulties are, and I am overwhelmed with astonishment as to how such observations were made by polar explorers at all.

There is one point more to which I wish to refer. It is extremely desirable that the work done so well in the north should be carried out in the south. Some eighteen months or two years ago, a strong committee was appointed by the Royal Society, to wait upon the then Government, asking them to do something to help forward an antarctic expedition. The magnetical reasons for such an expedition were then fully explained, and I don't know that, in the comparatively small interval of time that has elapsed, there is much to add to them. I may, however, just refer to the main point. As every member of the Geographical Society knows, a vast portion of the southern hemisphere is covered with water. There are only two or three great projections of land running into it. At these points we know something of the magnetic state of the Earth, but of the intervening regions of the sea we know comparatively little, and it is essential, if we are to master the problem of the Earth's magnetism, that our knowledge should be increased. I therefore can only say, from the point of view of the science of magnetism, we want especially observations in the southern hemisphere, and I only hope the great impetus given by Dr. Nansen to polar exploration may, by some sort of resonant vibration, spread from the north to the south.

Prof. Judd: It may appear at first sight that Dr. Nansen has brought back a message which will be very disappointing to geologists, when he tells us that in that great area there is practically no land, and that there is no hope for the geologists to learn anything new in their

particular domain. But I need not point out that there are many facts that may be obtained by polar, and even by north polar, exploration which will be of great interest to geologists, such as the nature of the bottom of the sea in that area; and we must all sympathize and rejoice with Dr. Nansen, that although no special provisions were made for deep-sea soundings, yet, with that wonderful ingenuity so largely the secret of his success, he managed to extemporize a line and obtain soundings that have been of such great value. Nevertheless, with proper appliances I doubt not we should obtain many samples of the bottom of this great ocean, and, more than that, it is possible that even dredging might be accomplished with proper appliances. But, taking the land which has been visited, it is far from devoid of interest. Sir Joseph Hooker has pointed out the wonderful character of the ancient flora found in the Arctic regions, now carried to a much more northern point by these researches of Dr. Nansen; but I would remind you that those remarkable beds of Jurassic rocks, which contain the flora in question, are associated with volcanic rocks of great interest. Many geologists have had to regret the loss of specimens, but few have had to assign for their loss such a cause as that which deprives us of Dr. Nansen's specimens—their having been stolen by foxes. There is no doubt that the nature of these volcanic rocks is worth careful consideration. We are inclined to ascribe volcanic rocks to the same age as the stratified rocks with which they are associated; and, without denying that the whole of these volcanic rocks may be of Jurassic age, I would remind you that our own volcanic rocks, now known to be Tertiary, were long supposed to be Jurassic, because they were intruded into rocks containing Jurassic fossils. It is possible that part, if not the whole, of these rocks may really be of different age from the beds with which they happen to be associated. It may be that the basalts and other rocks found in the west of Scotland, and reaching away through Iceland to Greenland, may be found in the lands visited by Dr. Nansen, associated with an older series of volcanic rocks. There are many problems for a solution of which we must look to the new expedition we have almost had promised us to-night by Dr. Nansen, an expedition which, traversing the Arctic Ocean at a higher latitude, may bring us news of other new and interesting lands.

Dr. JOHN MURRAY: The President and Dr. Nansen referred to the depth of the polar basin and the temperature of the deep water as among the most interesting results of the expedition of the *Fram*. I cannot say that the results, so far as at present made known, are in any way unexpected, either with reference to the depth or the temperature of the deep water. The observations in this unknown region are of the very greatest importance, and we look forward to the publication of details with great interest; but, so far as we can at present judge, the results are precisely what oceanographers would have expected. In

the first deep-sea investigations, Thomson and Carpenter pointed out, to the north of Scotland, two areas at the bottom of the sea in which the temperature of the water at depths of half a mile differed as much as 16° or 12° C. These areas were not distant from each other more than 10 or 15 miles. The fauna in the two areas differed from each other as widely as the temperatures. It was believed that these waters of different temperatures existed at the bottom without any intervening barrier. After the return of the *Challenger* Expedition this area was again examined by the *Triton* and *Knight Errant* expeditions, and a ridge was found stretching between the north of Scotland and the Færoe islands, with an average depth on it of 250 fathoms, separating the cold from the warm water. On the north side of this ridge ice-cold water is found at a depth of 250 fathoms, and water of -1° C. at a depth of 300 fathoms. But the Norwegian North Atlantic expedition has shown that these temperatures are found at a much greater depth along the western coasts of Norway. At the arctic circle the isotherm of 0° C. lies in the eastern part of the Norwegian sea at a depth of 400 fathoms, and the isotherm of -1° C. at a depth of 900 fathoms. At the latitude of 70° the isotherm of 0° C. lies at a depth of 660 fathoms, and the isotherm of -1° C. at a depth of 1100 fathoms. This is evidently due to the warm and salt water from the Atlantic sinking towards the bottom as it reaches higher latitudes. I should not expect a very cold temperature at the bottom in the region traversed by the *Fram*. At a latitude of 80° to the north of Spitsbergen, the highest temperature of the sea-water (3° C.) occurs at a depth of 100 fathoms beneath the surface, and it is evidently this water which sinks in the polar area and gives the relatively warm water reported by the *Fram*. In the western parts of the Norwegian sea we find a condition of matters much the same as the *Challenger* found at the antarctic, viz. cold fresh water on the surface overlaying dense and warm water at a depth of 100 and 200 fathoms. From these considerations, those engaged in working out the *Challenger* observations have long been convinced that there was deep water towards the pole, and in my papers the depth of the polar basin has always been taken as not less than 1500 fathoms. It must be remembered that the range of temperature reported by the *Fram* rarely exceeds a degree and a half in the deep water. The observations of the *Fram* have confirmed the theoretical views of oceanographers, and cannot be said to have been in any way unexpected. It is, however, a very great thing to have made direct observations in this almost inaccessible region. Dr. Nansen has cut out of the unknown a great region, and has placed it well within the known.

Dr. BOWDLER SHARP: I am sorry to say that, in the course of my studies of birds at the British Museum, and in the different volumes of the Catalogue I have had to write, it has not fallen to my lot to work out many of the birds of the arctic regions, and I am not perfectly

learned on that subject: still, I take it that the compliment paid me by the President, in calling on me to speak, means that perhaps the audience would like to know what ornithologists think of Dr. Nansen's voyage. We have heard, and every one confirms it, that in every branch of science his results have been of the greatest importance. So far the poor man has not had a moment to give us the results of his biological observations; but, from what we know of him, we are certain that what there was to be done was done, and that his discoveries will be placed before us in due time. Still, the interest of research in the arctic regions, as regards birds, always sums itself up into one or two directions to the explorer: "Be sure to find the egg of the Knot, or Curlew-Sandpiper, or find out Ross's Gull—tell us where it breeds." Dr. Nansen found Ross's Gull breeding, and that is all ornithologists can ask of an arctic explorer, that he solves one or two of these questions, and as Dr. Nansen has done that, I am sure his minor observations will also be of importance. Perhaps the audience may not know what Ross's Gull is. It is a very beautiful little Gull, with a hood and a wedge-shaped tail, and is called the wedge-tailed Gull. One of the specimens so called after the gallant commander occurred, or is said to have occurred, in Yorkshire, and two specimens in breeding plumage have been found off the coast of Greenland, and one of these was purchased by your late secretary, Henry Seebohm, and presented to the National Museum, where we have regarded it as one of our greatest treasures. There are not many specimens in museums, certainly not in breeding plumage. A number of specimens were got by the American expedition to Point Barrow: they were all young birds, and were seen only in September and October, travelling in flocks from south-west to north-east. But the breeding-place was entirely unknown, and therefore I should like to join my voice in congratulating Dr. Nansen on having solved one question of the few we set him to do when he went on his expedition.

Colonel FEILDEN: When our President advances the view that "the great polar sea is probably a sea without islands, and if so it is a sea of solitude," I would venture to point out certain facts which may throw a ray of light on this problem. The late Dr. Bessels of the *Polaris* expedition was the first to recognize and to record the number of foreign boulders scattered over North Greenland, in the vicinity of Thank God harbour, from the present shore-line to altitudes of 1000 feet. He remarked upon their absolute dissimilarity with the rock *in situ*, and, struck by a peculiar rock predominant amongst these erratic boulders, which he thought was precisely similar to a rock found *in situ* in South Greenland, came to the startling conclusion that when these erratics were deposited from their ice-rafts, the set of the current had been from the southward, up Smith sound, and into the polar basin. A more erroneous deduction could

not have been arrived at. Following in the footsteps of Bessels, and with the advantage of his experience—for he was a man of great scientific attainments—and fortunately having had much greater opportunities of geological investigation in that area, I satisfactorily determined that the present direction of the Smith sound current had not altered, certainly not for a long period of geological time.

The glacio-marine deposits so widely distributed over Grinnell Land and North Greenland testify to the fact that the currents and conditions under which these beds were laid down, from elevations of 1000 feet above the sea to the present-shore line, have been precisely similar. At every elevation we find the same coniferous wood from the great rivers of Siberia, the remains of the same fauna, and the same character of ice-borne erratic boulders. These erratics are of diverse lithological structure, but there is a widely distributed erratic amongst them, so marked in its composition, that I have little doubt it is the one that induced Bessels to formulate his theory of change in the present set of the currents in Smith sound. The rock I refer to is a peculiar gneissoid rock largely composed of garnet. Its structure is described in the *Geological Magazine* for 1895. This rock does not appear *in situ* on the American or Greenland shores that have been visited, from Capes Alexander and Isabella to Robeson's channel, and certainly not from Cape Union or Thank God harbour to Aldrich's Farthest on Grinnell Land, or to Lockwood's Farthest. From whence, then, are these erratics derived? Not from Siberia, I think; not from the New Siberian islands nor Bennet Island. For it is noteworthy that of the many boulders examined in Grinnell Land, there was not one, I believe, identical in character with the known rocks *in situ* on the Asiatic side of the polar basin. Satisfied that the ice-transported erratics now resting on the shores of Grinnell Land and North Greenland facing the pole are not derived from the southward, and not from the continent of Asia nor the islands lying north of that continent, I think it not improbable that there may be some land or islands within the unknown area of the polar region from whence these erratics have been brought, and are still being stranded on the shores of Grinnell Land and North Greenland.

SIR LEOPOLD McCLESTOCK: I beg to thank the President for his kindness in inviting me to speak. I have no doubt he expected me to say something interesting, but I am not going to say anything scientific; I will only remind you that I have had a great deal of experience of work in the arctic regions of the New World—something like ten years—and I have sledged over the ice-surface for 4000 miles; but I will only make one observation to you, which is to point out the strong dissimilarity of the ice north of the American continent from that which Dr. Nansen found on the Siberian shores. In all these long sledgings and years of experience

and exploration, I never found any of these open lanes in the ice. We never found any cracks which we could not jump over : so utterly distinct was our ice from what Dr. Nansen experienced. We carried no boats ; we did not want them ; there was no current to set this polar pack in motion. There it remained outside the Parry islands, locked up by land, year after year until it attained enormous thickness. I think Lieut. Meham, when sledging along the west coast of Prince Patrick island, in May, 1853, speaks of immense ranges of ice piled high up, from being forced in upon the shore, and showing a thickness of ice not less than 50 feet. It must have taken a long time for the floe to obtain such thickness as that. I only dwell upon these facts to show how different the two sides of the polar hemisphere can be, and that our experience in the Franklin search throws no light at all upon what Dr. Nansen has so clearly described to us to-night. I will not take up your time any longer, except to remark that the cause of this immense difference in the thickness of the ice encountered is worthy of investigation.

SIR GEORGE NARES : What we have learnt from Dr. Nansen's expedition is that there is evidently a dividing-line across the polar area, say somewhere from Bering strait across to Lockwood's Farthest north of Greenland, where you will find this heavy, or, as we called it in the *Alert* and *Discovery* Expedition, paleocrystic ice on the American side, and the lighter ice on the Asiatic coast. We knew before Nansen's expedition that along the Siberian coast there was young ice, i.e. one year's ice. We put it down to the warm water discharged from the enormous Siberian rivers, which so largely exceed the discharge from the American side ; but it is quite news to us now that this young ice two or three years old extends all the way to where we knew there was a current always running out of the polar seas. Nansen's voyage, in conjunction with the *Jeannette* drift from Bering strait to the Siberian islands, shows that all that drift is purely a wind drift. It was slow, but in a direction away from the land towards the northward and westward. Still it cannot be depended upon, and I think Dr. Nansen was very fortunate in his first year in getting away from that land, where we expected his difficulties would be. Once well away, we knew he would come across if his ship could keep up. As to this dividing-line, there is the question as to the thickness of the ice on the American side, and as to where it is derived from, and whether that line is straight from Bering strait or curved. There is no doubt that all along this coast the ice which we found north of Melville island and at Patrick's island is sea-ice. Now, Nansen tells us that in one year he measured 7 or 8 feet of ice, practically the same as our old measurements in other regions ; he gives us in two years 13 feet of ice that was solidly frozen ice without any rise of one floe over another. Very well ; now if you annually get floes of that kind tipped together, you will soon get ice of extreme thickness. Sir

Joseph Hooker put an important question about evaporation. Well, off the *Alerik's* winter quarters the evaporation far exceeded the precipitation; but then, of course, you won't find the same balance all over the polar region; we were beyond the area of precipitation, and experienced very little snowfall. Further south it would be different, but at the border of the arctic sea evaporation far exceeds precipitation, therefore in the summer there is the constant melting down of the blocks on the top level of the floe, and consolidating into a regular massive piece of ice. Our measurements were over 100 feet thick, and there is no doubt, as Colonel Feilden says, there was no idea of this being formed anywhere except at sea. Of course, there is melted snow mixed with the salt-water formed ice, but there is no doubt that they were really floe-bergs. I won't enter into the question of land; I am rather inclined to go against Colonel Feilden and join with Nansen that there cannot be large lands. There may be some small islands, but certainly it has ceased to be now an important question to us. Nansen's journey over the ice of course enabled him to explore a much larger area than the friends he left on board the *Fram*. They were frozen up in their surroundings and drifted on; and it is a most remarkable thing to us—I join several arctics with me—the enormous quantity of ice all through this region of practically less than one year's growth. He comes across ice over and over again that has only been formed a few months. What I am aiming at is to put before you that his voyage is in no way an exceptional one. There is evidently this continuous drift through the polar region, and the enormous quantity of young ice met with proves that it can have been in no way an exceptional season. Now we are talking about another expedition, perhaps starting from the American side of Bering strait. I will only make one remark—that is, we must dwell upon the large number of American whalers that have been lost in the ice just in that spot north of Cape Barrow, and never been traced or heard of. There must be something different in the winds there, not blowing the ice off to get away from the land into the southerly current, totally different to that met with on the other side. As an interesting remark, talking about the paleocrystic ice, there is no doubt that there are few outlets through which it can come. We found it drifting through Robeson channel; it also is met with in the *cul-de-sac* south-eastward of McClintock channel, where it undoubtedly stopped Franklin from making the north-west passage.

As far as geographical questions go, I think I should like to have had this discussion a few months later. We have not had time to properly dwell on the large results of the Nansen Expedition; we have scarcely had time to read his interesting book; but the meteorological questions alone, in conjunction with those of the Jackson-Harmsworth Expedition for three years, will certainly enlighten us very greatly when

we can put them together. The question of the temperature of the sea was what I had a great deal to do with in the *Challenger*. We found very much the same tongues of cold and warm water in the antarctic region. But I should like to know by-and-by, when Dr. Nansen's results have been thoroughly worked out, how he explains finding warm water down at the bottom: it is most interesting, and found nowhere else in the world.

Dr. NANSSEN: I will try to answer the various questions that have been put, and will do so as briefly as possible. Sir Joseph Hooker asked about diatoms in the north: I think in this respect the expedition has brought back some interesting results, as I discovered a whole new world of diatoms living on the surface of the polar ice in the fresh-water ponds found on the surface of the floes through the short summer in the north. I discovered some brown, yellow, or red-brown spots as soon as the ponds were formed. I thought it was mud, but by taking a little of this mud and placing it under a microscope, I discovered it was swarming with diatoms, and amongst them I found small animals feeding on them. As time went on I saw these small patches growing and forming holes in the ice, and thus a whole flora of diatoms was living on the ice, freezing up every winter and reviving again for the summer. I regret I cannot say anything about them to-day, because that is material which has to be worked out by a specialist, but I dare say there are many new and interesting forms amongst them. I also found a good many small infusoria. Unfortunately, I had not much literature with me to help me in these my investigations; but I brought material back, and I hope in this respect to get some results. On the whole we thus see that on the surface of the floe-ice, constantly travelling across the polar region, there is a fauna and flora living every summer and freezing up in the ice every winter, and I dare say some of these diatoms may be the same as those found by the Nares Expedition in the ice north of Grinnell Land. In connection with this, I may also remind you that one of my evidences before I sailed, which I believed proved a current running across the polar region, was the mud I found on the drift-ice along the east coast of Greenland; in this mud diatoms were discovered which were only found once before in the whole world, and that was at a cape a little north-west of Bering strait. It may be that many of these diatoms found during this expedition will be the same species and of the same sort.

As to deposits of diatoms on the bottom, I believe our results are in the negative as far as my investigations go. In the samples of mud from the bottom of the polar sea I found but little organic life; the mud seems mostly to consist of mineral substances, and there was even very little chalk or anything of that kind to be discovered in it. Sir Joseph Hooker asked me one question as to the evaporation from the ice. I could not make any direct investigations on the subject, but from what

little I could make out, I got the impression that evaporation was considerably less than the precipitation. The whole winter there was a good deal of condensation of moisture going on on the surface; it was constantly covered with hoar-frost, and we made some attempts to determine the amount formed from day to day: it was considerable. I have not the material here to-night, so I cannot tell you more about it. I must say that my impression is that during the winter there is very little evaporation from the surface, but a good deal of condensation of moisture on the polar ice. Sir George Nares seemed to be of the opposite opinion. But there is one thing that struck me: if the paleocrystic ice is sea-ice, and the layers are consolidated by precipitation every year, then I believe this proves that the evaporation cannot exceed the precipitation; for if such was the case, I do not understand how the layers could be formed.

Prof. Rücker asked about our magnetic observations. I am sorry to say I cannot give much information about that here to-night, as that was not my line. Ident. Scott Hansen had to take care of these observations, and as I had much to do with my own investigations, I had little time to spend over his, but I believe that they will throw some light on the problems mentioned by Prof. Rücker. I believe that the observations are exceedingly carefully done, and I can only say that, from what I saw of Scott Hansen's method of working, he was a constant object of my admiration. He carried on his observations with never-failing care at any temperature, even at 60° below zero, and came in with his nose or fingers frozen, and would not admit that it was cold outside. From what little I can gather from these observations, we found the inclination and declination pretty much what you would expect. Neumayer had already, before we went out, given us some data as he thought we should find them, and we actually found much the same as he had expected; but I believe the inclination, so far as I remember about 87° at the furthest north, was little more than was expected. There was one thing that made observations at times a little difficult: the disturbances of the needle were often very great, owing to the northern lights. I believe on one occasion we had disturbances about 24° , and that is, as far as I understand, unusually much.

Prof. Judd asked me a question about the geological results, and he spoke about the deposits in the arctic sea. I have already said something about it. I hope the samples will throw some light upon the deposits, though, of course, a new expedition, well equipped with deep-sea sounding apparatus, would bring back better samples. I believe these deposits will prove to be extremely devoid of organic matter, and will mostly consist of mineral substances. He said he thought it might be that the basalts of Franz Josef Land are Tertiary. I cannot deny it; only one thing makes me think they are Jurassic rocks, and

that is, that they rest on a bed of clay reaching from the level of the sea up to 500 feet above it. This is Jurassic (Russian Juraj). Immediately on this clay rose the basalt, and on the top of the basalt I found in one place, with Jackson and Koeltitz, plants and fossils, which have been examined, and are found to be of late Jurassic age. The flora is mostly coniferous, and seems, as Prof. Nathorst says, to point to a not very warm climate, though naturally much more favourable than the climate in these regions to-day. This is one reason why I and Prof. Brögger, who have examined these basalts—although there has not been time for exact investigation—came to the conclusion that they were of Mesozoic origin. One circumstance that might also point in the same direction: the rocks are different from the basalts of Scotland, the Færoes, and Iceland; there is extraordinarily little olivine iron ore. They seem to resemble some basalts which are known from Spitsbergen, and Prof. Brögger believes that these belong to one area of eruption. I therefore believe that we must consider Franz Josef Land and Spitsbergen as belonging to the same group of islands; also that in the still unknown distance between them we will find a series of islands, mostly of volcanic nature.

I will only make a few more remarks as to Mr. Sharpe's question about the ornithological results. He asked where we found Ross's gull breeding, and I pointed to a place on the north-east side of Franz Josef Land. They were in the first islands we met with. I must, however, point out that I did not actually see birds breeding. I got the impression they must breed there because I saw old birds and young birds together the same year, and there were so many of them. I could not easily imagine they had come from a land far off, as I did not know of any such land. They were just in the neighbourhood of these islands, and as soon as we went away we did not see them any more. On the spot where we spent our last winter we did not see a single Ross's gull, while on these islands, not many miles to the north-east, it was a quite common bird—almost as common as the ivory gull and the kittiwake; that was the reason that led me to believe that the Ross's gull was actually breeding there. It may breed on the rocks on the beach, like the ivory gull, or perhaps on the ice; nobody knows. Of course it is not probable that they should breed on the ice; still, on these islands there were but few rocks. As the President remarked, we saw little auks in the north, but we saw more dovekies. As far north as we went in the *Fram*, we saw birds in the summer-time. It is extraordinary how far birds will fly away from land. In June and July, 1895, to the north of Franz Josef Land, we could see flocks of little auks and dovekies coming from the south, and then returning to the south again. We understood that these birds came from some land, and wished we could follow them; but we had to travel for weeks and weeks before we came to that land, which they probably reached in a few hours: and when

settled for the winter in Franz Josef Land, we saw in the spring the birds (little auks and dovekies) steer away out to sea: we could see no water, but they went straight out, and returned after twenty-four hours. The birds we saw on board the *Fram* were mostly ivory gulls and other gulls, dovekies, kittiwakes, Ross's gulls, mallomocks, scures, and a few little auks. These birds do not prove that there was any land in the neighbourhood, as I think they may be expected wherever there are water-lanes, because there they find plenty of food—small crustaceans; the birds we shot were always full of shrimps and small crustaceans. I believe these birds fly across the polar sea anywhere.

The circumstances to which Colonel Feilden drew attention in connection with my doubt about the palæocrystic ice, that there are diatoms in the layers of dust, is interesting, and, face to face with such a fact, I will give in and say I believe that the ice must be of oceanic origin. As to Colonel Feilden's belief in a land to the north on account of certain erratic blocks found on the shores of Grinnell Land and North Greenland, I will just put one question. Why could not these come from the interior of Greenland? May there not be far away under the glacier cover, rocks of the same description? and then I don't see any reason why blocks from them should not be carried to the coast by the glaciers. So long as we don't know the rocks in the interior of Greenland, I think the most natural explanation must be that these erratic blocks have come from that direction. I will just close with a few remarks on the interesting statement made by Sir George Nares about the palæocrystic ice. Now, in my opinion this ice is one of the most interesting problems in the polar region, a problem which I should like to see solved as soon as possible. I think we have here something quite different from the ice we have seen. If this palæocrystic ice really is oceanic, it must, of course, be very old, and I think it could only reach that thickness in the neighbourhood of land. My opinion is that this ice must be formed near the American side where the drift is stopped by the islands, where the pressure is tremendous, and the floes are piled up and frozen together, snow covered, and levelled up. I don't think ice of 50 feet thickness can easily be formed in the open sea, because I believe the loss of heat by radiation from the surface would not penetrate sufficiently quick to such a depth, and when the ice reaches a certain thickness, it cannot, therefore, easily grow much thicker by direct freezing. I believe this extraordinarily thick ice will only be found quite near the lands on the American side, and when we come a little further north we will find thinner ice more like the ice we found, and which has more motion than that across which Albert Markham travelled on his wonderful journey.

I said before I should like to see an expedition start from the sea north of the Bering strait, in the same way as we did. I know, as

Nares said, that many American whalers have been lost there, and have been drifted northwards and disappeared; but that is just one reason more why I should like to see an expedition start from that side. These whalers are not specially built to stand any pressure of ice; they are built to hold a big cargo, and they pay extraordinary little attention to the strength of the ship. If you build a ship like the *Fram*, and go north there, I think that is the best way of solving what is perhaps the most important problem left in the north polar region.

The PRESIDENT: It remains for me to propose to the meeting a vote of thanks to Dr. Nansen for the extremely interesting discourse he addressed to us at the commencement of this discussion, and for the great care he has taken in noting the remarks made by the various speakers, and in replying to the questions put by them.

The thanks of the meeting are also due to the distinguished scientific men and arctic officers who have joined in the discussion.

THE MESOPOTAMIAN PETROLEUM FIELD.*

By Captain F. R. MAUNSELL, R.A.

THE existence of a petroleum-bearing belt of country on the north-east of the lower Tigris valley has been noticed by various travellers, the most recent being M. de Morgan in his '*Mission Scientifique en Perse*,' who deals with the naphtha pits near Kasr-i-Shirin and Shuster, so far as came within the scope of his travels. He has gone very thoroughly into the geological formation of the country near these deposits, and infers† that the pits at Kasr-i-Shirin are part of a petroleum-bearing belt extending from Kirkuk to the north of the Pasht-i-Kuh; but if the notices of various other travellers be collated, it will be found that the prospective field of enterprise is of even greater size and commercial importance. Of the various sites of these springs, I have had opportunities myself of seeing those at Hammam Ali, El Fatba, Mendali, and Kifri, and have passed through most of the country near them. Bitumen from these pits has been utilized from the very earliest times, there being a legend that the coating of pitch used for the Ark was obtained from Hit, while from Al Hadhr came the Greek fire used with such effect against the siege implements of Severus.

Although known for so long a time, the deposits have never been satisfactorily explored, or their value tested by borings on modern

* Map, p. 588.

† '*Mission Scientifique en Perse*,' vol. ii. p. 86.

scientific principles; and, except in the rude pits made by the inhabitants to collect the oil, no attempts have been made to test their commercial value. The existence of such a large number of sites in a well-defined area, and the considerable quantity of bitumen and naphtha which now comes to the surface, would suggest a large supply of oil if properly tapped, and the establishment of a commercial industry of great importance. The petroleum-bearing belt commences near Mosul, and extends south-east in a broad band skirting the base of the Kurdish and Persian frontier hills as far as Shuster. The following outline of the geological formation of the country will assist in determining the position of the belt.

North-east of Mosul, the last outliers of the great Kurdish mountains consist of a series of well-defined ridges of limestone overlooking Alkoah and Sheikh Adi, parallel to each other, and running generally north-west and south-east. Continuing to the south-east there is the long wall of limestone extending from Girdamamik, on the Great Zab, to near Keui Sanjak, on the lesser Zab river, forming the limit to the hill country. West of the Sulaimania district is the Kara Dagh, a similar rocky dividing-line extending from the lesser Zab to the Diala. On the left bank of the Diala comes a lowland basin, in which are situated Kasr-i-Shirin and Zohab. This stands at the north-western border of the many ranges comprising the Pusht-i-Kuh, and is bounded by the Sunbula Kuh, the Kuh-i-Ahengiran, and Kuh-i-Delaho, whose extremities overlook it, and the rocky ridges north-east of Zohab, which extend to the Diala. In the Pusht-i-Kuh, the parallel character of the various limestone ranges becomes even more marked, and follows the general line of the Turko-Persian frontier some 20 miles from it.

The general line of limestone ridges thus sketched out from Mosul to the Pusht-i-Kuh marks a sharp division of geological formation. Immediately to the west of them the well-defined character of the hills ceases, and a broad belt of undulating country, crossed by several small sandstone ridges, supervenes. In this formation appear many beds of gypsum, particularly noticeable on both banks of the Tigris at Mosul, where they are used for supplying building-cement, and an easily worked white and gray marble. Also near Kifri, and along the ridge to the north-west of it as far as Tuz Khurmatli, are extensive deposits of gypsum; also at Mendali and between Husseinie and Zorbatie. The Karachok and Baravan Dagh are isolated sandstone ridges rising to no great height above a general plain of conglomerate formation.

The Jebel Hamrin is a well-marked feature which commences not far north of Mendali, and extends north-west till it is lost in the plain beyond the Tigris near Kala Sherghat. It rises some 600 feet above the plain, and is mostly composed of sandstone and conglomerate. Along the western edge of the Pusht-i-kuh, following the line of the Turko-

Persian frontier, is a belt of low hills of sandstone and conglomerate formations, with occasional beds of gypsum, about 20 miles broad. The great alluvial plain of the lower Tigris and Euphrates commences below Tekrit and Hit, and extends to the Persian gulf, forming the southern limit of the petroleum-bearing belt. The most northerly deposits in the belt are at Hammam Ali, some 15 miles south of Mosul, on the right bank of the Tigris. Here are hot sulphur baths, much resorted to by the sick from Mosul, the water of which is slightly salt. There is a small basin from whence a fairly abundant supply of crude petroleum can be obtained by skimming the surface; while long threads of bitumen are constantly oozing to the surface in this and in a number of smaller pits close by, which are filled with warm water. The only buildings are the small house covering the sulphur baths and a few temporary erections close by. The whole are situated on gently rising ground about half a mile from the river-bank. The strata appear to be nearly horizontal, and the rock is a soft whitish limestone.

The next point in the belt is Al Hadhr, some 45 miles to the southwest, where naphtha pits exist in the neighbourhood. There are extensive ruins here of the ancient town of Hatra, which do not appear to have been very recently visited by travellers, so that no detailed information regarding the pits is obtainable.

Rich* mentions naphtha pits at Kiara, on the Tigris right bank, 25 miles south of Hammam Ali, and they are probably of the same formation as at the latter place. Close to Kirkuk, in the low sandstone and conglomerate ridges near the town, are several petroleum springs, which form one of the most important commercial resources of the place. The principal caravan route from Baghdad to Mosul passes through Kifri, Kirkuk, and Erbil. A few miles south of Kifri, in the low ridge called the Jebel Oniki Imam, are naphtha pits, which are also worked, but are not so extensive as those at Kirkuk.† At Tuz Khurmatli, on the same line of hills at Kifri, are also naphtha springs, situated about 2 miles east of the place, at the foot of the Neft Dagh, or "Naphtha mountain." Gypsum is found and utilized for making cement at many points on the ridge near Kifri.

At the El Fatha defile, where the Tigris passes through the Jebel Hamrin, are extensive exudations of bitumen, and signs of the existence of petroleum. Along the left bank of the river at the defile runs a cliff 10 to 12 feet high of soft white limestone, with some conglomerate in horizontal strata. From these exude long threads of bitumen and naphtha, which pollute the river for nearly 3 miles along the bank, and there seems every promise here of satisfactory results if proper borings

* Rich's "Residence in Kurdistan" (1896), vol. ii. p. 136.

† *Ibid.*, vol. ii. p. 277.

were carried out. Not only is the considerable extent of this site important, but as it stands on the river-bank, the oil could be at once shipped into light steamers and barges, which could navigate down to Buara, where they would meet the larger ocean-going vessels. Probably, if the line of the Jebel Hamrin to the south-east were explored, further extensions of these deposits could be found. On the right bank, some 7 miles up stream from El Fatha, is a large sulphur spring issuing from the base of a continuation of the Jebel Hamrin, which skirts the river there.

The pits at Kend-i-Shirin, over the Persian border, are exhaustively described by M. de Morgan, who gives an excellent photograph* of one of them, showing the kind of basin dug by the Kurds, to collect the naphtha. This is typical of the rude excavations made by the inhabitants at the other points in the belt.

The actual position of the pits near Mendali was not visited by me, but the Jebel Atish, or "Fire mountain," some 3 miles south of the track up the valley of the Ab-i-Gunjir, was pointed out as being the site. The exact position of the frontier-line is very indeterminate here, and is only marked in the Gunjir valley by a loose pile of stones. The country on the Persian side of the frontier is almost entirely deserted except by a few nomad Kathur Kurds. In 1868 the pits were in working order, and the crude petroleum used to be taken to Baghdad in skins carried on camels. The pits may, therefore, be assumed to be in Turkish territory: the oil was used for lighting in Baghdad until superseded by the better refined American or Russian article. The belt of hills here intervening between the open plain on which Mendali stands, and the first ridges of limestone belonging to the Pusht-i-kuh, is of sandstone with conglomerate, of exactly the same formation as at El Fatha, and some 20 miles wide. It further extends down the whole of the frontier-line to the southern end of the Pusht-i-kuh, whence it trends off towards the Shuster and Dizful plains. There seem to be no actual naphtha pits between Mendali and Shuster; but while crossing this belt of country through Husseinie to Zorbatic, beds of gypsum were passed, with some salt springs, and a country very similar to that near Mendali was noticed.

The frontier-line of the Pusht-i-kuh is still very imperfectly explored, and some connection between the deposits near Mendali and those at Shuster may yet be found.

As regards the springs at Shuster, General Gordon states† that "American kerosene oil is being imported for lamp purposes to take the place of the Shuster crude petroleum, said to have been used there for

* 'Persia Revivited,' General Gordon (1865), p. 161.

† 'Mission Scientifique en Perse,' by de Morgan, plate xxii. vol. ii.

centuries. This petroleum contains an unusual amount of benzine, and, being highly explosive in lamps, the Shuster people, who can afford to pay for the safer substance, have taken to American oil. These oil springs may yet become the object of practical operations should the Nasiri Company develop the resources of the Karun valley."

Treating the Shuster deposits as separate from those farther north, we see that the most important section of the Mesopotamian petroleum field extends from Mosul to Mendali, a distance of 220 miles, with a breadth of about 60 miles. The Tigris navigation offers a natural outlet towards the Persian gulf, and is now regularly used for traffic all the year round between Busra and Baghdad. A line of railway from Baghdad through Kifri, Tuz Khurmatli, and Kirkuk to Mosul could bring the produce from these places to the river. If such a line were extended from Mosul to the Mediterranean, communication towards both seas would be complete. Possibly one result of the present political troubles of Turkey may be a greater facility in obtaining concessions to develop some of these remarkable mineral riches on modern lines, and, if properly explored, there is no doubt but that the Mesopotamian petroleum field might be made yield results of the greatest commercial importance.

BEAZLEY'S 'DAWN OF MODERN GEOGRAPHY.' *

SIR EDWARD BUXBURY'S great work on ancient geography, published in 1879, covered the ground from Homeric times to the age of Ptolemy. Mr. C. Raymond Beazley has set himself the task of continuing the history of geography through the Middle Ages, from Ptolemy to Prince Henry the Navigator. It is a great and difficult undertaking, but one which, if well executed, will be of the first importance to geographical students; for no such work at present exists in our literature. The first volume, which has now been received in our library, treats of the earlier and more obscure period, from A.D. 500 to A.D. 900. But Mr. Beazley promises a second volume, which will treat of the Vikings, the Crusaders, the journeys of the thirteenth-century monks and merchants to the far East, and the views respecting the sphere, of the philosophers and astronomers of the thirteenth century and of the Renaissance.

Mr. Beazley's introduction gives an interesting general review of

* *'The Dawn of Modern Geography: a History of Exploration and Geographical Science from the Conversion of the Roman Empire to A.D. 900, with an Account of the Achievements and Writings of the early Christian, Arab, and Chinese Travellers and Students.'* By C. Raymond Beazley. With reproductions of the principal maps of the time. London: John Murray. 1897.

the geographical ideas, and of the travels undertaken during the Dark Ages. The first three chapters are devoted to the travels of pilgrims, of merchants, and of the Nestorian missionaries in Central Asia and China. Chapter VI. contains a detailed account of what may be called patristic geography, or science tortured into apparent harmony with revealed religion as interpreted by the monks of the Middle Ages. We are introduced to the fabulous tales of Solinus, to the portentous system of Cosmas, and to the theories of Dicuil, as well as to the less elaborate ideas of the Fathers. Here Mr. Beazley also explains the map-making of the early Christian period. The two last chapters contain excellent accounts of the Arabian geographers and their systems, and of the journeys of the Buddhist pilgrims.

This is the least promising period in the history of geography, a retrograde period, when science was thrown back for centuries by Cosmas and his like, and when the more correct learning of the ancient Greeks was despised and forgotten by Christians, and only cherished by the Arabs. Yet a knowledge of geographical history during the Dark Ages is essential, if we would fully understand the point of view of the cosmographers and explorers of the Renaissance. To furnish us with this knowledge, Mr. Beazley has spared no research and no pains. His work has two great merits: it is exhaustive as regards available authorities, and it is made interesting by judicious condensation combined with literary skill. The author has undoubtedly filled a gap in geographical literature, and in so doing he has rendered an important service to our science.

RECENT BIOGRAPHY.

The publications of the past year include the biographies of four British travellers, widely different in character and achievements, but worthy to be grouped together as alike devoted to the service of their country, and as having added, each in his own degree, to our knowledge of the Earth's surface. Travellers are so often known to the public chiefly in connection with their exploits in the field, that any fresh light on their personal life and character, and on the qualities to which they owed their success, is distinctly of value.

In writing the life of Sir John Franklin,* Mr. Traill had a difficult task to perform, both on account of the publicity which had already attached to the career of the hero, and by reason of the great mass of unpublished matter from which a limited selection has had to be made

* 'The Life of Sir John Franklin, Bt.' By H. D. Traill. With maps, portraits, and facsimiles. London: Murray. 1896.

to bring the work within the compass of a single volume. His literary skill has, however, enabled him to put together a pleasantly written and well-proportioned narrative, which makes the reader realize, as he has perhaps never done before, Franklin's many noble qualities—his modesty, kindness, and generosity, as well as the undaunted spirit and devotion to duty which shone out in all his actions.

Being not concerned—as was Admiral Markham's excellent summary of Franklin's arctic work—with one particular side of the hero's varied career, it of course deals more at length than the latter with other than purely geographical interests. One of the less-known chapters in Franklin's life, to which present events give a special interest, is that of his command in the Mediterranean during the troublous times following on the declaration of Greek Independence. The arctic journeys—down to their tragic yet appropriate termination in an icy grave—are clearly described, and the account of the early land expeditions, which is, perhaps, not so familiar to the present generation as it deserves to be, is specially worthy of perusal. The vividness of the story of suffering connected with the first of these is heightened by a reproduction of the scarce legible pages of the traveller's note-book, filled in by him when almost at the last extremity of starvation. The incident of an encounter with Eskimo during the second land journey exemplifies Franklin's wonderful moderation in dealing with natives, which might well serve as a pattern to some modern travellers.

In this respect the great arctic voyager finds a worthy counterpart in the late Joseph Thomson, a short but interesting account of whose life has been written by his brother.* It is matter for satisfaction that the work should have been placed in the hands of one so competent to speak of the details of his early home and college life, for with the story of his African career so fresh in the minds of the public, it is the early section of the book which presents most that will be new to the general reader. It is deeply interesting to trace, in the early life of the explorer among the simple but healthful surroundings of his father's home in Dumfriesshire, the influences which did much to fit him for his future life-work in the opening up of the Dark Continent. The romantic and imaginative element in his character, and the love of nature which led him to throw himself with characteristic enthusiasm into the study of her secrets, found full scope in the picturesque scenery of the southern Scottish hills, with their wealth of historical associations. It may not be generally known at what an early age the desire to emulate the deeds of African explorers first took root in his mind. When only eleven years old, the works of Livingstone fell into his

* 'Joseph Thomson, African Explorer: a Biography.' By his brother (Rev. J. B. Thomson, Greenock), with Contributions by friends. London: Sampson Low, 1896.

hands, arousing in him an ardent interest in the dark and mysterious lands of Central Africa, and from that day forward he maintained a fixed purpose of becoming an African explorer himself. It was this exploring instinct which led him to devote himself to the study of geology, to prosecute which he entered the university of Edinburgh. During his college days Thomson showed the fixity of purpose which in later years enabled him to overcome the many obstacles that confronted him, while his exuberant spirits and frank and kindly disposition endeared him to all with whom he came in contact. It is needless to speak of his African career, which can be followed step by step in his brother's pages, the various journeys being illustrated by a useful series of maps. From the connected view which is thus presented, the reader is enabled to realize the great influence exercised by Thomson's work on the political relations of this country with the African continent, each of the recently formed British spheres being traversed by his routes.

Our third book takes us to the more settled regions of Asia, and therefore deals less than the two former with purely geographical exploration. In his life of Brian H. Hodgson,* Sir W. Hunter gives a fascinating picture of a remarkable man, better known perhaps to a former generation than to the present, although it is scarcely three years since the veteran *savant* passed away from among us. Born in the closing year of last century, and reaching India, after a distinguished career at Haileybury, in 1818, Brian Hodgson belonged to a past race of Indian civilians, who, in the times of expansion ushered in by Lord Hastings' rule, found ample scope for the highest qualities of courage and self-reliance in the administration of newly formed provinces, far removed from the central authority. His long connection with the court of Nepal as British resident proved him eminently fitted for the task entrusted to him, and the strength and wisdom of his policy were abundantly shown by the events which followed his removal. His advocacy of the formation of Gurkha regiments may be specially mentioned as leading to the most valuable developments in our own time.

Sir W. Hunter gives us a pleasing insight into Hodgson's personal character, quoting freely from private correspondence. His goodness to his parents and other members of his family stands out in clear relief, and the long years of separation had no power to diminish the warmth of his affection. It is, however, as a scholar and scientific investigator that we are more particularly concerned with him, and the latter chapters of the book treat fully of his untiring labours in the study of nature and man in the remote regions in which his lot was cast, labours

* 'Life of Brian Houghton Hodgson.' By Sir William Wilson Hunter, K.C.B., M.A., LL.D. London: Murray. 1896.

which made his name known to scientific men throughout the world. Sir W. Hunter carefully analyzes Hodgson's contributions to knowledge, and shows clearly the value of his researches in the fields of ethnology and zoology, as well as his services in the more practical causes of agricultural development and vernacular education.

Limits of space forbid more than a brief reference to the life of Sir John Drummond Hay,* which has been judiciously compiled by his daughters from his own notes and memoranda. The long connection of Sir John with the court of Morocco†—from his appointment as consul-general in 1845 to his retirement from the post of minister in 1885—renders the book a valuable contribution to our knowledge of that interesting country, and it abounds, not only with vivid personal reminiscences and sporting adventures, but with details regarding the history of the country and the life of its people. During the whole period of his life in Morocco, Sir John's one aim was the upholding of British interests in the country, and his great influence with the sultan and personal hold on the people, no less than his tenacity of purpose and shrewd diplomacy, made him successful where many would have failed. The book may be recommended as presenting a life-like portrait of a devoted public servant, and one no less admirable in the more private relations of life.

DUNGENSES FORELAND.

By F. P. GULLIVER

1. *Dissected Weald Dome*.—After the formation of the great plain extending from the structurally complicated Welsh mountains across the coastal plain of England to the simple dome of the Weald, the region was uplifted and dissected, the remnants of the plain now surviving as upland areas where the more resistant strata have longer withstood dissection. It is immaterial, for the purposes of the present article, whether one regards this plain as produced by marine denudation,‡ or considers the present adjustment of streams to structures so perfect as to demand two cycles of subaerial denudation.§ It is important, however, that the facts of planation, uplift, dissection, and final partial submergence should be clearly in mind, before one undertakes the study of the stages of development in Romney marsh or Dungeness point.

2. *English Channel*.—The borings which were made on the French and English

* 'A Memoir of Sir John Drummond Hay, F.R.S., F.R.G.S., F.R.M.S.' with a preface by Sir Francis W. de Winton, K.B.S.G. Portraits and illustrations. London: Murray, 1890.

† The popular form "Morocco" is retained for the name of the country, and is stated in a note on pronunciation to be undoubtedly a corruption of *Maghrib*, while "Morocco" is allowed to be derived from *Muridook*.

‡ A. C. Ramsay, 'Phys. Geol. and Geog. of Great Britain,' 5th edit. pp. 341-346.

§ W. M. Davis, this Journal, vol. v., 1895, p. 127.

sides of the Strait of Dover, in connection with the plan for the tunnel beneath the channel, showed the rocks to be practically continuous upon the two sides. The form of the upland in north-western France also indicates that it was continuous at one time with the planed surface of the Weald dome, for at corresponding elevations the nearly level surface of the chalk is continued across the anticlinal arch of the Pays de Bray. It is most probable, therefore, that after the formation of this surface of planation, which may be regarded either as an abrasion surface or as a peneplain, it was uplifted, and extended from central England to central France across the area now occupied by the Strait of Dover and the English Channel.

For the purposes of the present paper, it will be necessary to touch but lightly the most fascinating problem of the succession of forms in the history of the English Channel. It is not a typical "drowned valley." When compared with the exquisite valley-forms in south-west Ireland, which have been entered by the sea, it is seen that it is not a sufficient explanation to say that the channel is simply a sub-aerially carved valley depressed beneath the sea. Nevertheless, ever since Goldwin Smith studied its bed and shores, and called attention to its valley form,* it has generally been regarded as a valley formed at a time when the land stood higher. The excavation most probably has been accomplished by rivers; but the dissection was not done by one river acting during one position of the land, but by differing systems acting at different times, and possibly even flowing now east and now west.

The work of Messrs. Hébert, Dollfus, De Lapparent, Prestwich, Reld, James Browne, James Geikie, and others, has shown that a land-barrier existed from Ireland to France before the middle Eocene time; that in the middle of the Eocene, streams flowed westward into an arm of the Atlantic, approximately where the western portion of the channel is now found; that during Miocene, Pliocene, and Pleistocene time there were many oscillations and tilts of the land, giving opportunities for sub-aerial dissection when the land stood relatively higher, and for marine abrasion and detrital aggradation when the sea made an ingression into the valleys; and that the present bed of the channel forms a broad plain of sand and clay surrounded, even at Jones and Little Sole banks at the western end of the channel, by a great belt of gravel and shingle.

It will be too great a digression to discuss here whether the Weald dome was breached by a branch of the Rhine running from the area of the channel toward the North Sea, or by the lower Rhine emptying into the Atlantic through the English Channel; to consider the question whether the Strait of Dover, forming such a striking contrast to the normal, systematic, and consequent streams found elsewhere upon the dome, was formed by a stream antecedent to the uplift of the arch, or by one superposed during the late stages of planation; or to discuss the probable effects of tidal action during former periods of depression of the valley of the English Channel. A geographical study of the evolution of the English Channel during the successive cycles introduced by the various elevations and depressions of the land offers an attractive subject for future field study.

3. *Initial Form of Coast.*—For this study of the stages of development of Dungeness foreland during the present cycle of coastal abrasion, it is necessary simply to accept the fact of the breach of the Weald dome by the Strait of Dover, and to concentrate attention upon the time when the sea and land took approximately their present relative positions. From the characteristic drowned valleys of the Thames, Medway, Stour, Rother, Ashburn, Ouse, etc., now filled to a greater or

* *Quart. Jour. Geol. Soc.*, vol. vi., 1849, pp. 69-97.

less extent with detritus, one must conclude that the sea at this time made an incursion upon an area of land-curved topography. The substantially dissected land offered a new portion of its surface to the attack of the sea, and consequently the line where the waves lapped for the first time against the land at the beginning of this cycle may be called the initial shoreline. For convenience all the land back of this initial shoreline will be called the "oldland," and all alluvial accumulation built in front of the oldland in the stages of development during the progress of the cycle will be called "foreland." As the writer has already said,* the local use of the word "foreland" in the names of a few promontories—as, for example, North and South Forelands in the region under discussion—seems no valid objection to the present expressive generic use.

From observation in the field and from a study of the forms as shown upon the Ordnance and Admiralty maps, the writer has drawn a probable hypothetical initial shoreline, which is reproduced in Fig. 1. Where the cliffs are higher at the present stage of dissection, it is inferred that the initial coast has been more cut back. By extending the slopes of the upland surfaces, the probable approximate position of the outermost points has been drawn. It is worthy of note that, after allowing a similar extension upon the French coast, there still would remain 3 miles of open water between these two hypothetical shorelines in the Strait of Dover. The ridge of shoals between Calais and Dover may represent an island not yet consumed at the opening of the present cycle, but it seems probable that at this period in the development of the region there was at least some open water between France and England.

Upon both of the maps accompanying this paper (Figs. 1 and 5), the oldland is cross-hatched, the foreland is left blank, the cliff made by the sea eating into the oldland is represented by a double black line with conventional hachures, and the probable initial shoreline is indicated by a broken line.

4. *The Present Coastal Form.*—Between the Thames estuary and the Isle of Wight, the coasts of the counties of Kent and Sussex, or, physiographically speaking, the coasts of the dissected Weald dome, form a succession of headlands nipped back by the sea, alternating with forelands consisting largely of alluviated valleys. If one consults simply an outline map of the Strait of Dover, he will find that the three most prominent points lie north of Dover, south of New Romney, and at Beachy Head. He might easily think that these three were all projecting, because composed of more resistant rock. In the first and third cases this is true, but Dungeness point, south of New Romney, consists of loose detrital waste worn from the rocks of the Weald dome. Why it projects so far into the water in a region of such strong sea abrasion is the question here considered.

While the area of this extensive cusped foreland is in greater part made up of marshland, and has generally been discussed in the literature of this region as Romney Marsh, still it is almost certain that this valuable agricultural tract could never have been deposited, and then later artificially preserved, if it had not been for the outlying barren tract consisting of gravel and shingle called Dungeness point. Fig. 2 is a reproduction from the geological map of the survey, and shows the relation of the shingle as it exists to-day to the marshes behind. There are many successive ridges of shingle running in varying directions, and often with narrow strips of marsh enclosed between successive ridges. Such bands of marsh have been given the very appropriate name of "slashes" in New Jersey. These successive ridges evidently represent stages in the growth of Dungeness. The shorelines south-west of Lydd are the oldest, since these are less distinctly traced

* *Ibid.*, U.S.A., vol. vii., 1896, p. 400.

upon the ground than those near Dungeness light, and since their component pebbles are more weathered. These earlier formed shingle "falls" are now being cut by the sea, and the flint pebbles are being rearranged in new ridges near the point.

The most recent curves of aggradation are very prettily shown at the point when looking toward the centre of the cusped foreland from the lighthouse. Recent observations at the point indicate that this shoreline is here advancing at the rate of 9 feet a year. A mile to the west the sea is at present cutting into the shingle. Upon the eastern side of this foreland some twenty-three successive shorelines may be seen between Lydd and the present shoreline. These all curve sympathetically, indicating steps in the growth of the foreland. These ridges are not absolutely



FIG. 1.—SOUTH-EASTERN COAST OF ENGLAND.

D = Dover; F = Folkestone; Ha = Hastings; Hy = Hythe; NR = New Romney; R = Rye; Ram = Ramsgate; W = Wickhampton; cross-hatching = oldland; white areas = foreland; wavy line = cliff and slip; = probable position of initial shoreline.

parallel or continuous, for some twenty lines of aggradation at the cusped point were traced by the writer into fourteen at a point a mile north, and these fourteen were in turn traced into seventeen ridges at a point 2 miles further north. At one time there seems to be greater advance in one place, and when the complex conditions which govern deposition are changed, another point receives the most waste.

Mr. Drew has indicated on Sheet 4 of the 'Geological Survey of Great Britain' the former greater extension of the land into the sea south-west of Lydd, as is shown by the truncated lines of former shorelines, or "falls," which occur south-

west of Lydd. He says, "The shingle having come from the west and lapped round, so as to make the north and south 'fulls,' it is plain that the most westerly of these is the oldest. . . . The 'fulls' that stretch from Lydd Ripe towards Wigmore Pit were formed earlier, and as these do not curve round to the west, but, after running straight for a mile or two, abut against the present beach, they must have formerly extended further seaward, and have had their ends washed away."*

5. *Ideal Stages of Coastal Development.*—With a general idea of the condition of the coast at the beginning of the cycle, and of the present form of Dungess and the surrounding coast in mind, the next step is to consider the probable stages in the evolution of such coast and shore forms. The cycle was inaugurated by depression, therefore an irregular, bay-indented, possibly island-fringed initial shoreline obtained. On account of the amount of dissection seen in the Weald dome, approximately in the stage of early maturity, the valleys of the larger streams would have been considerably broadened, while those of the side streams would have been comparatively steep and narrow. This initial coast was attacked by the sea, and, early in the development of the coast and shore forms, a low cliff or "slip" must have been made in the coast all along the shore.

At a later stage in the development, the supply of load was just enough to equal the ability of the sea to transport, and a graded condition resulted. A beach now was seen at the foot of the cliff. This equilibrium would not last at all points, and aggradation would necessarily occur when more waste was supplied than the sea could carry.

The action of the sea in its attempt to eat up the land and re-deposit the abraded detritus in a great off-shore continental delta, which lies below the level down to which the sea is able to abrade, is described here as consisting of two parts, viz. *attack* and *transportation*. While in a general way one may say that the attack of the sea is accomplished by the waves, it must not be forgotten that a very large share of the wasting of the coast is done by the meteoric agents. As with so many other things in nature, the attack of the sea upon the land is a complicated combination of varying factors. To reach a generalization of value, one must carefully balance and weigh these factors.

Transportation may be divided into two classes: on-and-offshore transportation, and along-shore transportation. These two directions of movement are the resultants of all current action. Current is here used in its general sense, meaning any flowing movement or stream of water, and therefore includes the currents of the great ocean circulation, the tidal currents, and the local shore currents, produced by winds, waves, rivers, etc.

6. *Forms of Aggradation.*—The outlying islands would have been most quickly attacked, and were very likely consumed before they were tied to the land by bars, or "tombolos." The writer has proposed to call all such island-tying bars *tombolos*, taking the name from the characteristic forms uniting Monte Argentario with the coast of Italy. At present there are no such peninsulas in the region of the Weald dome, but further west Portland Bill is joined to the mainland by the tombolo, Chesil Bank.

A second form of aggradation characteristic of later stages of development in such depressed regions is the bay-bar, which is built across drowned valleys in various places by the deposition of detritus transported by along-shore currents from the sides, or pushed up from the bottom by on-shore currents. Behind the

* 'Geol. Folkestone and Rye,' *Mem. Geol. Surv. G.B.*, (1864), pp. 21, 22; Topley, 'Geol. of Weald,' p. 308.



FIG. 2.—ENTROPIC MINIMUM ON SUBCRASTAL CRISTON SHEET 4, (Geological Survey of Great Britain.)

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bay-bar alleviation will occur, and at the head of the bay a delta will grow. In time the space behind the bay-bar may be completely filled.

Another characteristic feature of the time, when more waste is supplied than can be immediately carried out toward the continental delta, is what may be called a tidal cusped foreland. It is found in regions of drowned valleys, long inlets, or narrow sounds, where the opposing shorelines are approximately parallel to each other.

When the on-and-offshore currents cannot distribute all the detritus, some of it must be carried by the along-shore component of the total current force acting, and deposited where the movement of the water is least. Where these forelands occur there are always found comparatively strong tides, so the tidal in-and-out flow is considered to be the determining agent in their production. Upon either side of the main current of the ebb and flood must be found more or less of an eddy circulation set up between this principal body of flowing water and the coast, and in the triangles of comparatively dead water between the several members of these small eddies of water a V-shaped bar will be formed, similar to that represented in Fig. 3. This V-bar will at first enclose a lagoon, which is in time converted at later stages into marsh and meadow land. Another method of growth of such tidal cusped forelands is where the



FIG. 3.—TIDAL V-BAR STAGE.

aggradation begins at the shoreline at the foot of the earlier formed "rip," and proceeds by successive steps outward into the channel. A typical example of the first class of tidal cusps is seen in West point, north of Seattle, in the state of Washington; * while an example of the second class is found in the same general region in False Dungeness harbour, or Port Angeles. A longitudinal section of a tidal cusp is given in Fig. 4.†



FIG. 4.—LONGITUDINAL SECTION OF A TIDAL CUSP.

7. *The Nipped Oldland.*—From the deductive study of what might be expected in such a region of submerged subaerially-carved topography, let us turn to the foreland as seen to-day, and see if the new features suggested by the theoretical consideration are to be found. In Fig. 1 the general relations of the foreland to the oldland are given, while in Fig. 5 the characteristic features of the foreland are shown upon a larger scale. The areas of shingle are given in Fig. 2, with the exception of the narrow strip which extends from Hythe toward New Romney, and which for many centuries has been added to by man to form the Dymchurch wall, protecting the rich fields of Romney Marsh from the westerly storms.

* See 'U.S. Coast Survey Chart,' No. 635.

† See, *ibid.*, No. 846.

If one walks across the flat surface of this great marsh northward from Dymchurch, he comes to a point north of the canal and westward from Hythe where there is a sudden change in slope. From the level plain one ascends a more or less steep slope across the narrow belt of Weald clay to the steep infacing escarpment of the Lower Greensand. To the west one sees the "inface," or retreating surface of the more resistant member of the Lower Greensand, carved by subaerial denudation, while to the east near Hythe the line of the present cliff and the former nip back of the foreland cuts diagonally across the direction of the escarpment. Further west, where the foreland abuts against a broader belt of the Weald clay, there is a less marked change of slope, but the line of the nip can be fairly well traced. Topley recognized the action of the sea upon the oldland previous to the growth of this foreland. He said, "Along the northern boundary of Romney Marsh the termination of the Weald clay is certainly an old sea-cliff, now worn down into undulating ground."* The railway has taken advantage of this gentle grade across the nip in entering the area of the marsh, instead of taking the route by the larger town of Hythe, where the engineering difficulties were much greater, both on account of steeper sea-cliffs, and also because the escarpment is more pronounced than further west at Ashford, where the oblique faults† probably lessen the resistance of the harder rock or *inface-maker*.

Upon the western side of the foreland the nip is found upon the irregular headlands and islands of the Hastings beds, which were formed by the depression inaugurating the present cycle. This nip extends for some little distance up the aggraded bays between Appledore and Winchelsea, as is indicated diagrammatically upon the accompanying maps. Near Appledore the nip is not at all pronounced, so that one, in entering this region by rail, hardly knows when he passes from the oldland to the foreland. Further south, upon the military road north of Rye, the nip is more pronounced, indicating that the marsh-filling occurred here at a later date. That up to a comparatively late date this was a more or less open lagoon through which the ships passed on their way to the port of Appledore, is suggested by the historical studies of this region, to which references are given in a later section.

8. *Bay-bar to F-bar*.—At the beginning of the cycle the area under discussion was the great Appledore bay, situated between the initial headlands which must have existed in front of the present cliffs, cut in the oldland at Folkestone and Hastings. As soon as grade was reached in the abrasion of the Hastings headland and along-shore transportation had commenced, there would have been a tendency on the part of the sea to attempt to close Appledore bay by a bar, extending north-east from Hastings headland. Such a bay-bar is indicated in Fig. 5, by the line of dashes, with one dot between each pair of dashes (1—1). The direction of the bar is taken from that of the oldest shoreline, now seen south-west of Lydd, and is extended to meet the Hastings headland. It seems highly probable that this first shingle spit was straight, as is indicated in the figure; but it is also possible that even at this early stage the bar had something of a cusped form, as has been indicated in all the succeeding stages. We know definitely the position of the north-eastern end of this early bar, and that the initial headland must have been to seaward of the present Hastings cliff. All but a very small portion of the material of this early bar has since been rearranged.

Five successive steps in the outgrowth of Dungeness foreland are indicated in Fig. 5. There are many more intermediate positions of the shoreline indicated

* Topley, 'Geol. Weald,' pp. 251, 292.

† *Loc. cit.*, p. 252.

in the shingle "falls," as one will see by looking at Fig. 2. One shingle ridge often fits closely up to the last, while frequently a narrow lagoon, or slash, occurs between two successive ridges. To illustrate the writer's theory of the formation of the point, five characteristic stages have been selected. The shoreline with the

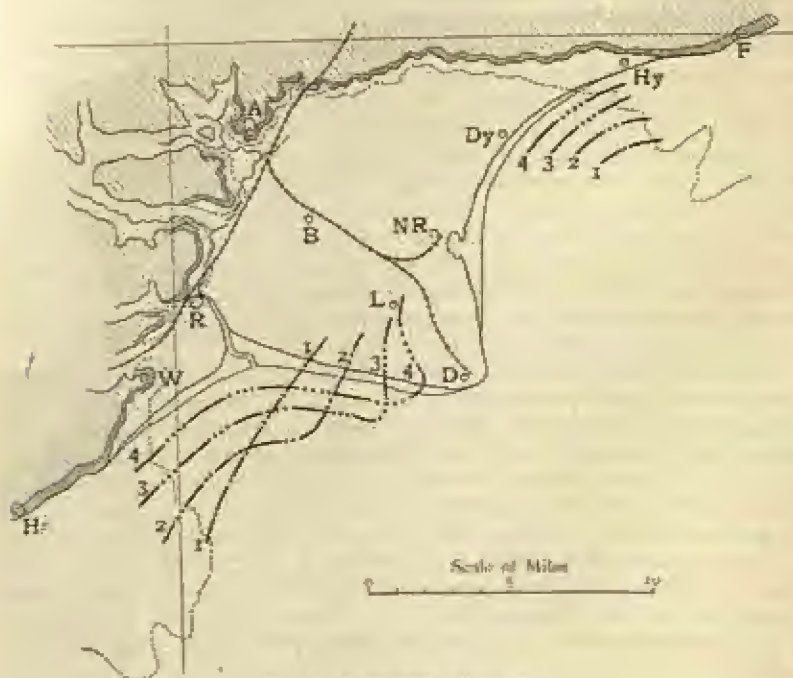


FIG. 5.—DUNGESESS FORELAND.

A = Appelbore; B = Brookland; D = Dungeness; Dy = Dymchurch; F = Folkestone; H = Hastings; Hy = Hythe; L = Lydd; NR = New Romney; R = Rye; W = Winchelsea; cross-hatching = oldland; white area = foreland; [diagonal lines] = cliff and nip; = probable position of initial shoreline; ——— = next succeeding shoreline stage in growth of foreland; ——— = second succeeding shoreline stage in growth of foreland; ——— = third succeeding shoreline stage in growth of foreland; ——— = fourth succeeding shoreline stage in growth of foreland.

sharpest curve is found to the east of Lydd (stage 4), and upon the coast to-day this shoreline gives a sharp turn to the west. During this fourth stage, as represented in the figure, the foreland had probably its most cusped form. It is now more blunt, and the curves of the earlier shorelines indicate that the foreland became sharper and sharper up to the stage marked (4).

The lines of dashes with respectively one, two, three, and four dots, as given in Fig. 5, show more clearly than words can do the writer's idea concerning the successive positions of this shingle. One must remember that the fixed points in these stages are the north-eastern ends of the four shoreline stages, and that the curves to the Hastings headland, as well as the form of the headland itself, might be more or less altered. Upon the Hythe side of the foreland there are no fossil shorelines. The Folkestone headland must, however, have extended further sea-

ward, and grade was probably attained before the coast was cut back to the present position; so the shingle now incorporated into the Dymchurch wall probably represents the present position attained by a receding series of wing-bars extending from the Folkestone headland. The five stages near Hythe, upon the right side of the foreland (shown in Fig. 5), may roughly correspond to the five upon the left side.

Dungeness foreland, then, appears to represent a transition from a bay-bar to a cusped foreland. The wing-bar attempted at first to close Appledore bay, and then, on account of eddies, changed its nearly straight form into a cusped point, which advanced gradually from south-west to north-east.

9. *The Rother and Aggradation*.—After the drowning of the land at the beginning of this cycle, the river Rother and its side streams began to build deltas in the narrow submerged valleys at the western end of Appledore bay. These small deltas, at a later time, became confluent between Appledore and Winchelsea. As soon as the shingle-bars extended far enough across the bay to make the water inside comparatively quiet, aggradation began, sediment being brought by the streams, the tides, and the winds.

It is very probable that the Rother had two main distributaries a thousand years ago: one, the Limen river, flowing out through an inlet in the bar south-west of Hythe, and the other flowing past Old Romney. It does not seem necessary to make the second course subsequent to the first.* In the course of this aggradation the river Rother, probably, many times shifted its course across these tidal flats; the last important change occurring in the thirteenth century, when the Rother at New Romney was silted up during some heavy storms, and was obliged to cut another outlet farther west across the shingle bar. The whole marsh between Appledore, Brookland, Lydd, and Rye, was doubtless flooded, and the overflow occurred where the shingle protection was the weakest—west of all the fossil shorelines (Fig. 5).

In the English Channel the flood tide makes from the south-west to the north-west much more rapidly than the ebb in the opposite direction. The direction of the dominant movement of drift has been observed to accord with the direction of the flood tide. That the Dungeness foreland has been produced by the meeting of the tides of the North Sea and the English Channel has been suggested by Redman.† It has been very common to attribute the formation of this great deposit to the tides, but the details of the process have not been explained, except in a most general manner, by the expression "meeting of the tides."

10. *Historical Studies*.—The geographical interpretation from form is corroborated by the history and tradition of Romney Marsh. The Dymchurch wall is an ancient sea-wall, early strengthened by man to enclose and protect the rich alluvial tracts behind.‡ The Rhee wall from Romney to Appledore is of Roman times, for Roman coins are found in the enclosed alluvial beds. The Roman wall is very likely built on an earlier structure. The forms of natural aggradation by tides and currents along the shore has been much altered by the work of man. Much low marshy land was early "immed," e.g. Boufface, Baldwin's, Denge, besides the great Romney Marsh.

* See Drew's account of these changes in Topley's 'Geol. World,' pp. 302-312.

† 'On the Alluvial Formation, and the Local Changes of the South Coast of England,' *Mss. Proc. Inst. Civ. Engrs.*, vol. xi (1852), pp. 162-204. See also Topley, 'Geol. World,' p. 304; Lyell, 'Prin. Geol.', 5th edn., 1867, vol. I. p. 529.

‡ Montague Burrows, 'Cinqve Ports,' 1892; Robertson, 'Archæologia Cantiana,' vol. xlii. 1880, p. 275; Wm. Hollaway, 'The History of Romney Marsh' (London, 1849); Wm. Soumerai, 'Roman Ports and Forts in Kent' (Oxford, 1893).

The historical study of the changes of form of Romney Marsh has been considerable, particularly on account of the question as to where Cæsar landed in Britain.* Romney, one of the Cinque Ports of ancient south-eastern England, has completely lost its coastline,† And now New Romney cannot claim any of the seafaring glory of its ancestor.‡

Mr. A. J. Burrows§ has made out from historical data changes in Romney Marsh which suggest the above geographical interpretation. The drawings of former positions of the spits and shingle beaches, which accompany the paper by Mr. Burrows, were not constructed with this type of tidal foreland in mind; but with a slight change in the direction of the hypothetical curves to accord with the geological evidence, all these former shorelines fall into a successive series of sympathetic curves, outlining a broadly cusped foreland.

The relation between geography and history can be very well shown in Dungeness foreland, and a review of the historical data in connection with the structural indications of former stages of development, would make a most interesting study. The historical students of Romney Marsh have not sufficiently regarded the fossil shorelines indicated by the ridges, and have placed too much reliance upon outlines given on early maps, which generally show poor sketching and little appreciation of geographical form. The question of property lines, as determined by old surveys upon this area of shifting alluvium, has an important connection with the historical problem.

English sailors have recognized in other parts of the world forms similar to Dungeness foreland, and have applied the same name to two widely separated deposits, both having a similar geological structure. One is in Puget sound, and the other is south of Patagonia, in the Strait of Magellan.

RUSSIAN EXPEDITIONS IN TIBET.

I.

M. V. PERYTSOFF'S EXPEDITION, 1889-1890.¶

THE Russian Geographical Society has added two more volumes to its admirable collection of works upon Central Asia, namely, the first and the third volumes of the 'Works of the Tibet Expedition, 1889-1890, under M. V. Perytsoff.' The first of them contains the leader's general record of the expedition, and the second embodies the records of Hoberovsky's and Kozloff's "excursions"—that is, reconnoitring journeys into the highlands of the northern border-ranges of the Tibet plateau. Both volumes are admirably published, and the former contains an excellent "Map of Eastern Turkestan and the Northern Border Highlands of the

* F. H. Appenzel, 'Cæsar Julius Cæsar's British Expedition from Boulogne to the Bay of Apudron, and the Subsequent Formation Geologically of Romney Marsh' (London, 1868).

† See 'Cinque Ports,' by Montague Burrows (1892), for the historical recorded changes upon Dungeness.

‡ For an account of the great invasion of the sea in 1287, see Hasted, 'History of Kent,' vol. viii. p. 148; Robertson, 'Archæologia Cantiana,' vol. xiii. (1880), p. 237.

§ 'The Surveyors' Institution Transactions,' vol. xvii. (1885), pp. 333-376.

¶ 'Works (Trudy) of the Tibet Expedition, 1889-1890, under M. V. Perytsoff,' Part I. and part iii. Published by the Russian Geographical Society. St. Petersburg: 1890.

Tibet Plateau" (40 miles to the inch), as well as forty excellent photo-engravings, which, better than pages of text, give an idea of the snow-clad mountains, the high dreary plateaus, the oases, and the lakes of the region, and partly of the inhabitants. A portrait of General Pyretsoff is also added. The other volume (part iii.) contains five maps (13 miles to the inch) of the regions visited by Roborovsky and Kozloff during their incursions into the highlands.

Much of what was veiled from our knowledge during that expedition has already been unveiled by both Roborovsky and Kozloff's last expedition, or by the explorations of British explorers, especially of Mr. Littledale. The terrible Takla-makhan desert, in the middle of Chinese Turkistan, has been crossed by Pyretsoff's own comrades during their subsequent expedition, and our knowledge of the borderlands of the Tibet plateau has already been extended. And, nevertheless, the two volumes before us are full of interest.

After the death of Prjevalsky, his comrades, M. V. Pyretsoff, V. I. Roborovsky (botanist), and P. K. Kozloff (zoologist), who were joined by a geologist, K. I. Bogdanovich, started under the leadership of M. V. Pyretsoff. They left the town Prjevalsk, crossed the Tinn-Shan *via* the Bilal pass, and came to Yarkand. Then, following the lines of oases, they passed through Khotan, Niya, and Chertchen, at the northern foot of the border-range of the Tibet highlands, making incursions into these highlands and exploring the "Russian mountains," which make the western part of the Astyn-tagh, and the Akka-tagh, which has received since from the Russian Geographical Society the name of "Prjevalsky's range." * Thus they reached Lob-nor, and then, turning northwards, went to Karashar, Urumchi, and Port Zaisan in Russian Turkistan. We thus find in General Pyretsoff's record (vol. i.) a wealth of information about the physical condition and the inhabitants of these oases; and, both in the first and third volumes, most interesting data in the structure of the outer fringe of the Tibet highlands, from the meridian of Khotan to Lob-nor (10° to 90° E. long.).

The work of General Pyretsoff opens with an excellent "Historical and Geographical Sketch of East Turkistan," followed by a chapter on the journey from Prjevalsk to Yarkand *via* the Belal pass. The next chapters, devoted to the description of the Yarkand, Khotan, and other oases, are extremely interesting. One would hardly suspect, for instance, that they would be so densely peopled as they are. Thus, the small Yarkand oasis (264 square miles) has a population of 150,000 according to the last census—that is, 567 inhabitants per square mile. The land is, of course, admirably cultivated, and all agricultural produce is cheap; while the few Indian goods which are imported *via* Ladak on horseback—the journey lasting thirty-five days—have to support a cost of transport of from 8s. to 10s. for each 36 English pounds. The next oasis, Kargalyk, has also a very fertile soil, and, although it covers only 132 square miles, its population attains to 30,000 inhabitants.

From Kargalyk the expedition went southwards to spend the hot months of July and August in the mountains, the spot Tokhta-khon having been chosen for that purpose. The spurs of the Kun-lun are named here Topa-tagh (Dusty mountains), and strike the traveller by the incredible steepness of their slopes, the sharp edges of their crests, and the numbers of deep and narrow valleys intersecting them. No pass across these mountains that would be accessible to horse, or even to man, is known, with the exception of the Topa-tagh-dayan. The rivers, after each rain or when the snows are thawing, rush through these narrow valleys with a fearful

* Astyn-tagh, not Altyn-tagh, as it stands on the map and in Pyretsoff's text, as is pointed out by the editor in part iii. of the present work.

force. Only about a hundred Tajiks from Vakhán inhabit that part of the mountains. While staying here, the expedition received the welcome visit of M. Duvvernoy, Major Cumberland, and Lieut. Bower, all coming from Ladák.

On September 13 the journey was resumed along the northern slope of the border-range. They visited the Khotan oasis (440 square miles, 130,000 inhabitants, to which the 30,000 inhabitants of the next two small oases, Zava-kurgan and Kara-kash, must be added), less fertile than Yarkand, but very well cultivated also, and distinguished by its various petty trades and cotton plantations, silkworm-culture being temporarily in a poor state on account of a silkworm disease. A lively trade in all sorts of wool is carried on with Russian Turkistan and partly with Ladák (*via* the Kilian pass). The next oasis, Chila (7000 inhabitants), owes its wealth chiefly to its fine sheep and silkworm-culture; while Keria (97 square miles, 14,000 inhabitants) is less densely populated than Khotan, and is given, to a great extent, to the culture of cereals—wheat, rice, and barley. The Keria river carries a considerable amount of water, and consequently penetrates for 200 miles into the Takla-makhan desert. And finally, the Niya oasis has only 2 square miles and 1850 inhabitants. On November 20 this last oasis was reached, and the expedition wintered there.

The next chapter is devoted to an ethnographical sketch of Kashgaria, whose population is estimated at 2,000,000, including about 200,000 nomads, and nearly 600,000 Dzungars, who have immigrated from China during this century; there are, besides, some three hundred families of Tsiganes. The oases are separated by deserts covered with small gravel (*sai*), and of difficult access during the hottest part of the summer. The layers of loess, of which the soil of the oases consists, but which are far thinner than in China, constitute their wealth. The high culture of these latter can best be seen from the fact that land attains very high prices—from £10 the acre in the less populous oases like Keria, to nearly £30 the acre in the Yarkand oasis. Irrigation stands at a high degree of perfection, and is learned by every inhabitant from early childhood. A common play of the children is to make miniature canals leading to their miniature play-fields, and irrigating them with water drawn from the real *aryks*. A European can only wonder at the clever way in which the natives solve the most difficult problems of irrigation. Elected elders (*m'rab* or *aryk-akhsal*) regulate the turn amongst the landholders for irrigating each field, and settle the possible disputes. Indian corn, wheat, rice, barley, two kinds of sorgho (*jagun* and *aryk*), and peas are grown, as well as lucerne, the wheat crops being from twenty-eight to forty to one. Cotton, flax, hemp, kunjut, poppy, tobacco, saffron, and madder plantations are the other culture, the best cotton being obtained in Khotan and Keria. Hemp is grown for hashish, which is exported to India. In fruit-growing the Kashgarians excel, but they grow no almond and pistachio-trees, which are, on the contrary, so common in Russian Turkistan.

General Pyevtsouff's sketch of the inner life of the Kashgarians—condensed, but full of interesting details—is very good, but could not be further considered here. He knows the people well, in all the details of their inner life, and has a high opinion of their sweet, honest, and amiable character, spoiled only by such features of servility as are fully explained by the recent history of the region. "An impartial explorer must recognise," he writes, "that the moral standard of the Kashgarians is very high. Robberies, arson, and murders are extremely rare, and are considered as a general misfortune; and theft is rare—much rarer than in Europe, with the exception, perhaps, of Scandinavia." Though Sunnié Mussulmans, the Kashgarians are by no means fanatics.

Kashgaria, as is known, forms part, since 1834, of the Sin-tshan province of

China, and is under a governor-general residing at Urumchi. It is divided into two provinces, Ak-su and Kashgar, under two *dao-tais* (governors), each province being divided into districts (Ak-su, Uch-Turfan, Kuchas, and Karashar; Kashgar, Yarkand, Kargalyk, Khotan, and Keria). Each district is divided into several *beks*, the *beks* being elected by the Chinese from among the natives. Each village has its elder (*aksakal*), and there are besides millionaires, centurions, and decarions (*min*, *our*, and *yur-bashis*). The richer natives seem to like Chinese rule, while the poorer classes prefer the rule of Yakub-beg, who was, they say, poisoned by the Chinese.

The winter in Niya ($37^{\circ} 5' N.$, $82^{\circ} 40' E.$, altitude 4460 feet) was relatively mild. Cold winds from the north-east, accompanied by dust-fogs, began only in December, and then the cold reached 11° Fahr., and even 5° Fahr. at night. Snow fell only thrice (0.1 inch, 0.05 , and 0.2), and this last, in February, lay on the ground for three days. Fearful storms, carrying with them a thick dust, and producing sometimes absolute darkness, began in February. The dust sometimes covered the ground three-tenths of an inch thick, and traces of animals were then seen on it just as they are seen upon fresh snow. Dust-storms were altogether so frequent, that the mountains (25 miles distant) could only be seen four times in five months. Spring began in the end of February, and already, in the middle of that month, the geologist, K. I. Bogdanovich, began his excursions towards the mountains, and Roberovsky soon followed him.

On May 6 the expedition left Niya, and continued to follow the foot of the border-range. Its northern slopes have for inhabitants the *tiglyks* only (mountainners), "who differ," General Pyertsoff says, "from the inhabitants of the oases by their shepherd life, and perhaps by a still greater purity of manners." They spend the winter in their very poor and small villages, but when the summer comes, they go with their flocks of sheep to the higher valleys and camp there. They have, however, no tents, but have in the valleys many caves, which were excavated in the loess or conglomerate cliffs, with a fireplace and chimney, and stay there. They accompanied the members of the expedition in all their mountain rambles, and won their full sympathies. They are admirable in mountain rambles, but have a superstitious dread of the high desert which lies further south.

Occasionally, when the winter is very cold, they move to a higher level in the mountains, probably because the temperature is milder there than in the valleys exposed to the cold anti-cyclones (p. 218). Speaking of winds, it is worth noticing that every day in May and June a cool wind used to blow from the north, i.e. from the Takla-makhan desert, between 11 a.m. and 5 p.m., while at night the wind was from the south, from the mountains. The existence of a cool wind blowing from the desert was the more astonishing, as it was known that since the 16th of May great heat prevailed at Niya, and the heat must have been simply unbearable in the desert. What the temperature in the desert must be in summer may be judged by the fact that on its border the heat reached 80° Fahr. in March, and the sand was heated to 140° Fahr. In summer its temperature must be 180° , or more. An ascending current of hot air must consequently exist over this immense desert, and the hot and extremely dry air of the desert, on rising to a higher level, must lose a considerable amount of its heat, which energy is spent during the ascent of the air. Considerable masses of cooled air must therefore accumulate at the higher levels of the atmosphere over the desert, and they must flow in all directions towards the surrounding mountains. General Pyertsoff remarked, indeed, that the cold wind, which attained a speed of from 10 to 35 feet per second at lower levels, and up to 50 feet higher up in the mountains, was not a horizontal wind; and by means of a specially devised apparatus, he found out that its angle with the

horizontal line was from 5° to 10° , the dip being from the desert towards the mountains. The same air-current was noticed later on in July and September as well.

The chief aim of the expedition was to penetrate as far as possible southwards into the plateau of Tibet, but almost unconquerable obstacles stood in the way. From Kashgar eastwards, to the meridian of Karla ($81^{\circ} 30'$ E. long.), the mountains which enclose Kashgaria run, as is known, from north-west to south-east. From that meridian the border-range takes a direction from south-west to north-east, and is known under the name of "Russkiy Khrebet" in its western portion, and Astyn-tagh further east till the longitude of 93° E. Many rivers pierce this immense border-range, in which, or in whose spurs, snow-clad mountains, rising above 20,000 feet, tower here and there (the Ak-tagh, $36^{\circ} 40'$ N., $84^{\circ} 50'$ E., reaches 20,880 feet). The high valleys of these rivers, before they have pierced the border-range, lie at heights of from 12,000 to 14,000 feet, and these valleys are still of a relatively easy access. The members of the expedition did, in fact, explore most of them. Thus the valley of the Tolau-khoja, in the south of Niya, was visited by Roborovsky; Lake Dashi-kul (13,880 feet), close to the Ak-tagh peak, was visited by Pyetsoff; and a large tract of land on the plateau was explored in the south of Cherechen and Lob-nor, namely, the upper Cherechen-Daria and the Togry-sai, both separated by a range (Muzluk, Achik-kol, or Moskovskiy) from lakes Achik-kul (14,320 feet) and Unfreezing, or Lyag-kum-kul (13,300 feet).

But an immense chain of mountains, the Akka-tagh, or Prjevalsky's ridge, rises in the south of these parts of the plateau, and separates them from the true North Tibetan desert. One of the peaks of that mighty chain was found to attain the altitude of 23,700 feet (under $87\frac{1}{2}^{\circ}$ E. long.). Immense portions of it are snow-clad, and the Kashgarians, as a rule, very rarely cross this chain. Pyetsoff's expedition succeeded in crossing that range and pushing southwards for a short distance into the desert in two places only. Roborovsky did so in the south of Niya, under the 85^{rd} degree of longitude, and there nearly lost his life. When he entered the desert, he found it utterly devoid of all vegetation. A distance of 22 miles was covered before the party met with a few bushes of willow. The surface of the desert was covered with rows of sharp quartzite *débris*, being the heads of quartzite strata running west and east; but even so mosses or lichens would grow on these stones, never watered by rain. Only snow falls all the year round in that dreary flat desert, having an altitude of over 17,000 feet. Roborovsky pushed for 10 miles southwards (to $35^{\circ} 40'$ N.), but all his horses, save one, broke down, and the party nearly perished in a snowstorm.*

Another attempt to push beyond Prjevalsky's range was made by Pyetsoff in the south of Dashi-kul. What these mountains are is best seen from the admirable photographs illustrating the volume under review. To cross the border-range was already very difficult,† and a halt of five days had to be made at Dashi-kul, to let the horses recover, which was again by no means easy, on account of the scarcity of fodder. Only bones of birds, which must have perished in their migrations, and skulls of wild yaks (different from the wild species known in North-East Tibet) were found around the salt lake Dashi-kul (13,880 feet). A base was measured for geodetical measurements on the shores of this lake, and several heights were determined: Ak-tagh, 20,880 feet; lower limit of snow-line on the south slope of the Astyn-

* See vol. iii, where this "excursion" is described in full, and a map, 13 miles to the inch, is given.

† M. Pyetsoff always says "the Kun-lun;" but, to specify, it must be borne in mind that it is of the Astyn-tagh that he speaks in this place.

tagh, 19,140 feet; and of a glacier on same slope, 18,080 feet. The rate of propagation of sound in this rarefied air (barometer, 17·95 inches) was also measured by the aid of the chronograph, and was found to be 1075 feet per second. As soon as the party, proceeding southwards, entered one of the transverse valleys of Prjevalsky's range, they found plenty of traces of antelopes, Tibetan hares, and kulangs, although the vegetation remained still extremely poor. The top of the pass had an altitude of 16,550 feet, and a beautiful view opened southwards. An immense high plain was seen, with rows of low ridges running upon it from west to east; further to the south-west a high ridge was seen, which went further and further and was lost below the horizon in the south-east. To the north masses of mountains appeared, their relative heights increasing, or, in other words, more and more deeply ravined as they were receding from the main range. The southern slope of the Prjevalsky range was very short, as it lies on the high plain, at a height of 16,100 feet. Water boiled there at 183° Fahr., and meat could not be boiled. Next day, July 9, a thick snow began to fall, but in one hour all traces of it disappeared, owing to sunshine and rapid evaporation in that dry air. No traces of river-beds or of any running water were seen; it must never rain in those deserts. The soil was gravel, with rows of hard slates appearing from beneath it. It was covered with fissures 5 inches wide—probably due to frosts—which were also filled up with gravel. In lower spots some moisture was found, nevertheless. The *Eurotia*, of a miniature variety, with thick roots, was the only plant seen—even lichens and mosses do not grow; but still a few *oryx* antelopes and one crested lark were met with, and traces of kulangs, hares, and Tibetan steppe-partridges were seen. The same dreary landscape was sighted from a mountain (19,150 feet above the sea-level) which Pyetsoff and his small party climbed upon, and the same high ridge was seen running to the south-west. A terrible snowstorm, with thunder, compelled the half-frozen party to return.

From all his information, General Pyetsoff concludes that all hope to explore this desert from the north, without spending a very considerable amount of money in organizing a row of depôts, must be given up; the more so as there are no yaks in Kashgaria, and yaks are the only beasts of burden which could live in those deserts without requiring fodder being brought for them from the lowlands.

From Bashi-kul the expedition returned to Karasai (at the foot of the Russkiy range), and thence went to Cherchen, crossing the Achanyu sands (a very characteristic photograph of these sands at Kara-muran is given; while another photograph admirably illustrates how the poplar forests die out on the borders of the Takla-makhan desert, being buried in loose dust). The Cherchen oasis has now lost 2000 out of its 3500 inhabitants, who fled to escape the heavy work which was imposed upon them by the Chinese, as they compelled them to dig out a new irrigation canal, never ended and now abandoned.

The expedition once more approached Prjevalsky's range, near Lake Yashil-Kul (87½° E. lat.). This range runs without interruption over all the length from Dashi-kul to this spot, and rises above the snow-line. In the east of the meridian of Charchen the snow-clad peaks grow more and more numerous, the highest of them being said to be the Tyumentiyk-tagh, about 180 miles to the east of Yashil-kul. There the range is said to bend toward the south-east (Marco Polo range?), entering a land which is unknown to the Kashgarians. In its northern spurs, especially further eastwards, good grazing grounds are said to be occasionally found. To the south of it stretches a land much higher than the valley between the Akka-tagh and the Astyn-tagh—that is, of a higher altitude than 14,000 feet. The hunters know that it is higher on account of the difficulties of breathing they experience,

and the length of the slopes. It never rains there, only some snow falling; and there are no high mountains—only hills upon its surface, with occasional depressions. All is covered with gravel, the only vegetation being the white willow (*Eurotia*) and a Tibetan *Carex*. There are no rivers nor lakes, but there are wet spots where a hole, being dug in the ground, soon fills up with water. Only a few wild yaks live in that desert, and this in summer only; but no other mammals, nor birds, nor reptiles have ever been seen by the hunters. Such is the "land beyond the clouds," as it is described by the hunters, who enter it only when they pursue wounded yaks. If a wounded yak crosses the border-range, they load a donkey with a provision of barley, and follow the track of the wounded animal, sometimes making a two days' journey beyond the border-range. When the yak has been killed, the best pieces of its meat are put on the donkey and brought to be sold to the gold-diggers, who stay on the northern slope of the Prjevalsky's range. The best pass across this chain is at the head of the Gökerna river.

When Roborovsky returned from his excursion to Lakes Unfreezing and Achik-kut, during which he explored a wide region between the Atyu-tagh and Prjevalsky's range (described in vol. iii.), and covered no less than 500 miles, the expedition began its return journey.

They visited the Lob-nor (2550 feet) and the Tarim, whose proper name is Yarkend-daria (*tarim* means "a tilled field" in Kashgarian). The lake rapidly desiccates, and a very old man, 110 years old, whom Pyetsoff spoke to (his son, fifty-two years old, was the only one who could understand the old man), said that he would not have recognized the land if he were absent all this time. Ninety years ago there was only a narrow strip of rushes in the south-west part of the lake, and the Yarkend-daria entered it $2\frac{1}{2}$ miles to the west of its present mouth, where now stands the Abdai village. The lake was then much deeper, and several villages, now abandoned, stood on its shores. There was also much more fish, and otters, which used to live there, but have long since disappeared. As to the Yarkend-daria, tradition says that two hundred years ago it used to enter another smaller lake, Uchu-kul, which was connected by a channel with the Lob-nor. This old bed, named Shirga-chapkan, can be seen still by the trees which grew along it. The greater previous extension of the Lob-nor is also confirmed by the freshwater molluscs (*Limnaea uricularia*, var. *ventricosa*, *L. stagnalis*, *L. peregra*, and *Planorbis sibiricus*), which are found at a distance from its present banks. Another lake, 400 miles in circumference, Kara-boyn* (*black isthmus*), lies, as is known, 27 miles to the south-west of Lob-nor. To the east of the lake, a salt desert stretches for a seven days' march; and further on begin the Kum-tagh sands, where wild camels live.

The return journey, from Lob-nor to Karashar (88 square miles, 11,000 inhabitants, out of whom 10,000 Dzungars), and thence to Urumchi, is also described with many interesting details, of which we only will mention the discovery of the Lak-chun depression; whose surface is below the level of the ocean. It was first discovered by the hypso-thermometer, which shew to Bogdanovich the quite unexpected temperature of boiling water, 212.63° Fahr. The barometer was immediately opened, and confirmed the indications of the former instrument. It stood at 30.55 inches, and the temperature of the air was so mild that the high stand of the barometer, continued on the next two days, could not be explained by the prevalence of a barometric maximum which, in Central Asia, is always accompanied by cold weather. The altitude of this depression was thus found to be 154 feet below the ocean—a fact which was also found in October, 1889, independently, by

* Not Kara-buran, as it stands on Prjevalsky's map.

Grum Grjmailo, and later on was fully confirmed by Roborovsky and Kozloff's expedition. This depression is now known to have a length of 95 miles and a width of 27 miles, including the town of Turfan and the villages of Luk-chun, Asa, Pichao, and Toksun.

From Toksun the expedition went to Urunchi (15,000 inhabitants, out of whom 13,000 Dzungars and 2000 Chinese), and thence to the Russian post Zaisan, following a new route past Telli-nor (960 feet), and the Chelikit pass. The post was reached a few days before the New Year's Day of 1891.

The above sketch gives, of course, but a very imperfect abridgment of the interesting contents of the first volume, and still less of Roborovsky's and Kozloff's work related in the third volume. It would be most desirable, at the same time, that an abridged edition be published of these volumes, and, in fact, of all the series of volumes on Central Asia, lately issued by the Russian Geographical Society. It would be in the interests of geography in Russia itself, and of science too, that such abridged editions be published in Russian (similar to what was issued in Sweden, for the general reader, after the first Spitzbergen expeditions), and they would most certainly be translated into all European languages.

II.

THE CONCLUSION OF ROBOROVSKY'S EXPEDITION, 1893-1895.

The last number of the *Izvestia* of the Russian Geographical Society contains the last instalment of the preliminary reports of Roborovsky's Tibet expedition. It is written by P. K. Kozloff, and reveals in the author a not common gift of descriptive power. By the end of July of 1895, the expedition left, as is known, the Nan-shan mountains and went northwards, across the Hami desert and the eastern spurs of the Eastern Tian-shan, to the Russian post of Zaisan. From Hami Kozloff made an "excursion" in the mountains, that is, covered some 400 miles with his surveys. He now gives both a general sketch of that part of the Tian-shan, as well as a more detailed record of his mountain journey.

The eastern part of the Tian-shan, to the east of the Hami-Barkul route, stretches from north-west to south-east for about 100 miles. Its middle part is snow-clad for nearly 85 miles, and there are no passes through this part of the chain. The natives know it under the name of Karlyk-tagh (snow-mountains). Both slopes are very steep, the snow-line lying on the northern slope, at Yashil-kul, at a height of 12,000 feet, while the peaks enclosing one of the glaciers visited rise to 15,000 feet. The steepness of the glacier is appalling; towards its end it falls almost vertically, and has ice-cascades. The glaciers of the northern slope, on issuing from the main chain, give origin to a mighty stream, named Ak-tugurnk. It pierces the Meehin-ala mountain, and flows north for 20 miles across the desert, to be lost in the Noun oasis. The streamlets of the southern slope unite in the Naryn, and feed the oasis of Hami. From the last snow-clad peak which lies farthest east, the Karlyk-tagh spreads in several radial chains, and in the westward of Bai the Tian-shan nearly ends—only a dreary, narrow, and low chain marks it; but further east it rises again in the rocky Kink-tagh, to be lost finally in the stony desert which stretches further to the south-east.

Only the northern slope is covered with vegetation, which is there very rich, and offers a beautiful sight. The upper limit of the tree-zone attains 9000 feet; higher up lie the alpine meadows. The Siberian larch and the fir (*Abies Schrenkiana*) make the forests, with a variety of under shrubs, while the *ak-dark* poplar is characteristic of the valleys. On the southern slope the vegetation is destroyed by the dry heat, and both vegetation and man seek refuge in the

narrow gorges, which are all the more beautiful on account of the contrast with the surrounding burned desert. The fauna of the Eastern Tian-shan is the same as in its western portion, but is somewhat poorer; bears and fallow deer are unknown, and stags are rare.

Nearly five hundred families of Chantus, or Taghobis (mountaineers), from Hami, live in small villages in the mountains up to altitudes of 7500 feet, growing some barley and wheat, and partly living a nomad life with their cattle. They have splendid grazing-grounds, keep a considerable number of cattle, sheep, and horses, and live very cleanly. The Belu-daban pass, which Kozloff followed on his way across the Karlyk-tagh, is 10,000 feet high, and another pass in the western part of the same mountains was found to be 9000 feet.

Leaving Hami on September 24, the expedition went to the Lukchun depression, taking the desert route, which is the worse of the two leading to the depression, but was not yet explored; and Kozloff, with one man only and two camels, made an excursion into the desert. It is stony desert which runs sloping from the Tian-shan to the Chol-tagh. The winds have blown away all the movable soil, and the whole is covered with table-like heights, from which a number of ravines run both ways, the watershed having but an altitude of 1000 feet above the sea-level. Low hills rise west and east. The work of the wind is extremely interesting in shaping the rocks into fantastic forms, and the imagination of the natives sees in those rocks ruins of mythical towns. It was this route that was followed by the fugitives from Hami to Lukchun during the Dungan insurrection, and the sufferings of the fugitives in the desert were terrible. The tamarisk and rushes are the characteristic representatives of vegetation in this desert, and in the animal world the antelope *Lepus sylvia* (*Gazella subgutturosa*);* of birds *Podiceps hendersoni* is a permanent inhabitant of the desert; and *Sylvia minor*, with a species of *Saxicola*, were temporary visitors. Many species of aquatic birds were seen on the shores of Shou-poor. At Lukchun the expedition found their true Cossack, Shostakoff, who had stayed there for two years, making those most valuable barometrical observations which will permit geodesists to determinate with great exactitude the level of this remarkable negative depression.

From Lukchun the expedition continued to move northwards through Urumchi and Manas to Zaisan, while Kozloff took an eastern route, old Guchen and across the Saur ridge of the Altai. The Tian-shan being already covered with snow, it was crossed in its lower part (Pass Gochan, 7500 feet), where it has a width of no more than 35 miles, and a most beautiful view of the snow-covered Jungarian plain was seen from its summit. Gochan (altitude 3200 feet, population two thousand five hundred) is very picturesque, being situated some 30 miles from the northern foot of the Tian-shan, where some Chinese and Chantus live, supplying the town with timber for export. In the company of smugglers, Kozloff crossed the last mountain tract which separated him from the Russian frontier, thus visiting the valley of the Urungu and the Kobbe Sans which was visited by Przhevalsky during his second journey, and are the dwelling-places of the wild camel, the wild horse, the *kulung*, and perhaps, also, of some unknown tribe of men who are said to be met with in this desert, especially in the neighbourhood of the stone monument Khan Oto. These *Kya-kigs* (wild men) are described by the natives as in size about the same as their own; a short wool, similar to the fur of a young camel, covers the whole body; black hair falling to the shoulders; dark eyes; body short, but legs rather long. They feed on roots growing in the desert; move about always in pairs; look severe and harsh; emit sounds when angry, or as a calling signal; when

* All zoological names are those given by P. K. Kozloff.

pursued, shout pretty loudly, and a whistling-sound is noticeable in that cry; run very rapidly; walk rapidly too, putting the feet wide apart. The Kirghizes whom Kosloff questioned said that they had been in possession of living *Kyz-kylks*, chiefly females *enervate*. They kept them for two or three days, offering them meat and cakes; but they refused food, simply crossing the hands on the breast and twinkling with the eyes. When looked at for some time, the *Kyz-kylk* became angry, turned his head, and made his hair bristle. When they were left free, they at once took to the desert, a comrade making his appearance in the neighbourhood where he concealed himself. The Kirghizes added that *Kyz-kylks* could be caught in winter, but never are seen in summer. "Personally," Kosloff writes, "I do not much trust to the rich imagination of the nomads, but I was interested in that communication, and give it that other travellers might verify if there is something in that information concerning the mythical problematic inhabitants of the Kobbé sands."

From the Urunga valley Kosloff went to lake Botogan-kul, which communicates with the Ulungur. Then he crossed the Salburty range, which belongs to the system of the Altai, and next the main range Saur, and entered the Russian village, Kenderlyk, from which a *troika* of post-horses brought him to Zaisan. The main body of the expedition, under Boborovsky, was already there.

Another 1200 miles were thus surveyed by Kosloff during these three excursions, which he made independently from the main body of the expedition.

P. K.

THE MONTHLY RECORD.

THE SOCIETY.

Royal Medals and other Awards for 1897.—The annual honours conferred by the Society on distinguished explorers and geographers have been this year awarded as follows:—the Founder's Medal to M. P. Semenov, vice-president of the Russian Geographical Society, for his early exploration of the Tien Shan range, for his important contribution to geography in the form of addenda to Ritter's 'Asia,' and especially for his long-continued efforts in promoting Russian exploration in Central Asia. The Patron's or Victoria Medal to Dr. George M. Dawson, C.M.G., F.R.S., director of the Geological Survey of Canada, for the geographical exploration carried out by him in the North-West Territories, in Alaska, and in other parts of Canada, during his long connection with the Dominion Geological Survey; and for the encouragement he has given to geographical work on the part of the survey officers. The Munroison Grant has been awarded to Lieut. Seymour Vandeleur, D.S.O., for his careful surveys during journeys and active service in Somaliland, in Uganda, Unyoro, and on the upper Nile, and in the Niger region; the Back Grant to Lieut. Ryder, of the Danish Navy, for his explorations and discoveries in East Greenland in 1891 and subsequent years; the Gill Memorial to Mr. C. E. Douglas, for his persistent explorations during twenty-one years of the difficult region of forests and gorges on the western slopes of the New

Zealand Alps; the Cuthbert Peek Grant to Dr. Thorvald Thoroddsen, for his continuous and extensive explorations in Iceland since 1882, and for his valuable contributions to the physical geography and geology of the island. The three honorary corresponding members chosen are—Prof. G. Dalla Vedova, secretary of the Italian Geographical Society; Baron E. von Toll, the Russian explorer of the New Siberian islands; and Captain Otto Irmingier, secretary of the Danish Geographical Society.

EUROPE.

The Lincolnshire Fens.—Books on the regional geography of England are so rare, that it is somewhat surprising to find two, both of considerable size and no small value, devoted to the fen country—the part of England perhaps least likely to evoke the enthusiasm of its inhabitants for their home. Miller and Skerchley's treatise on the Fensland deals with the whole district. Mr. Wheeler's work,* a new edition of which has just been issued, is more restricted in its scope and more practical in its aim. The reclamation of the fens is, from the geographical point of view, one of the most important chapters in the history of England, and in no part of the British Islands can one see so well as in the fen country the double influences of Nature on Man and Man on Nature, the elucidation of which is the greatest aim of geographical science. Mr. Wheeler's object in this book is to collect together all the available data for the history of the reclamation of the Lincolnshire fens. The history of the fenland is traced from the earliest times, when it was a waste watery country inhabited only by a few fishers and fowlers, through the Norman period, when it swarmed with churches and monasteries built on every island, and agriculture began to be introduced. The protection of the country against floods and the regulation of the waterways began as early as 1142 with the great sluice at Boston. The assistance of Dutch engineers was called in in the seventeenth century, and steady reclamation has since been carried on until the face of the country has been entirely changed, the meres drained, and the marshes reduced to trifling proportions. The legislation on the subject of the fenland, both local and national, is referred to in great detail, and full particulars are given of the engineering works by which the reclamation was carried out. Maps, of a somewhat rough kind, are given showing the system of drainage in each district, and described in a satisfactory manner. Special chapters are devoted to the agriculture, waterways, roads and railways, geology and water-supply, and natural history and products, climatology and health. In the last chapter the curious fact is noted that opium-eating is prevalent amongst the labouring classes, a legacy from the time before the introduction of quinine, when it was taken as a preventive of ague. A series of valuable appendices give (1) names of places, many of which have passed out of use; (2) a classified list of books on the fenland; (3) the titles of all Acts of Parliament relating to the district; (4) glossary of terms and local words of the fenland; (5) statistics of rainfall and climate; (6) levels; (7) borings; and (8) list of "sewers." The data are put together in a systematic and business-like way; and, in default of purely geographical memoirs, such local descriptions are of great value, promising much aid in any systematic geographical study of the country which may subsequently be undertaken.

* "A History of the Fens of South Lincolnshire, being a description of the rivers Witham and Welland and their estuary, and an account of the reclamation, drainage, and enclosures of the fens adjacent thereto." By W. H. Wheeler. 2nd edn. [1897.] Boston: J. M. Newcomb.

The Old Beds of the Adour.—M. C. Duffart contributes an interesting paper on the mouths and the old beds of the Adour river before the sixteenth century, to the *Bulletin* of the Bordeaux Geographical Society (February, 1897). Peculiar interest attaches to this river on account of its apparent relation to Cap Breton Deep, a narrow and immensely deep gully running in from the ocean close to the coast of France. M. Duffart does not touch on this part of the problem, however, but concerns himself with tracing the successive alterations produced by encroaching sand-dunes from the tenth century, when the mouth was close to Cap Breton, to the year 1578, when, on October 28, the river was diverted at Bayonne from its northern course behind the wall of dunes, and made to flow into the sea due west. He considers that there were three great periods of the movement of dunes: (1) The formation in prehistoric times of dunes on the great islands which then existed west of the ancient delta of the Adour. These now form the first series of old continental dunes far inland. (2) The formation of dunes during the Middle Ages up to the tenth century, consequent on the destruction of forests on the *landes* and the first old continental dunes. These gave rise to the southern lagoons of the *landes*, and turned the course of the Adour northwards parallel to the coast; they form the second series of old continental dunes. (3) The movement of modern dunes from the fourteenth to the sixteenth centuries. This led to the formation of the northern lagoons of the *landes* from the Etang de Léon to the estuary of the Gironde. Islands existed along this coast, which is now unbroken and uniform for more than 100 miles (save for the basin of Arcachon), as late as the eighteenth century.

Snow in the Austrian Alps.—Dr. Anton Swarowsky lately read a paper before the Austrian section of the German and Austrian Alpine Club on the facts observed with reference to the snow-layer in the Austrian Alps. A three years' mean, deduced from a full series of observations at the chief stations, gives the duration of the winter covering of snow below 3500 feet, as 150 days in the Northern Alps (from the end of November to the end of April), 115 days in the Central, and 110 days in the Southern Alps. The duration of the snow-layer is determined, in particular cases, not only by the temperature, but also by the quantity of the snowfall. Of the stations at the foot of the Northern Alps, Vienna retains the snow-covering for the shortest time—39 days—its total thickness being there about 3 feet. The smallest average amount observed was at Krems, on the Danube, where it did not quite reach 2 feet; whilst the Saizkaummergut, and particularly Annsee, showed the greatest amount of snow, a mean of no less than 16 feet being recorded. The observations with regard to the water-equivalent of snow are of special interest. Whereas the volumetric ratio of old snow to the water derived from it has been previously taken to be as 4 : 1, the observations proved it to be as 2½ : 1, or even 2 : 1. The value of the results is heightened by the large number of individual observations. The densest layer of winter snow—already possessing the character of "firn"—does not occur at the bottom of all, but, after a certain increase in density of the individual layers from above downwards, the lowest layers of all again show a diminution of density.

ASIA.

Russian Expedition to Manchuria.—So far as may be judged from the news about the expedition which was sent out this year to Manchuria, under Messrs. Auer and Komaroff, its results are very interesting. From the Cossack village Poltavskaya, the expedition crossed Manchuria to the village Mikhailo-Semenovskoye (on the eastern slope of the little Kinkhan, above the junction of the Amur with the Sungari), thus crossing the Manchu mountain region, then the Manchu-Mongol plains and the Sungari-Amur lowlands. The general aspect

of the region, so far as it was ascertained by the expedition, is as follows:—The mountain region of Manchuria stretches from the north-east to the south-west, containing the little Khinghan range (Donsse-ahn) in the north, and the Liao-Tung (Liao-tung) peninsula in the south. This mountain range is separated on the east by the Khaogka-Ussuri lowlands from the coast-range Sikhote-ahn, and on the west by the Matchu-Mongol low plain from the Great Khinghan (the border range of the high plateau). "Both the climate and the vegetation of the middle portion of Chinese Manchuria," the Russian Geographical Society's Report continues, "are, all taken, similar to the climate and vegetation of the Amur portion of that region. The southern winds of the East Asia monsoon bring to it a mass of moisture, and result in a regular period of rains, attaining their maximum in August. Frosts begin already at the beginning of September, and continue till April. The granitic nucleus of the Manchurian mountains gives origin to the sands and impermeable clays, upon which cornfields are scattered, the most fertile of them being on the surface of basaltic lavas. The virgin forests of Manchuria consist of deciduous trees, but they are of no use for culture, which is limited to low valleys. Chinese emigrants have peopled nearly the whole of that region, Manchus occupying now but the northern portions of it."

Formation of a New Rapid on the Yang-tee.—Mr. Consul Bourne has sent us details respecting the formation, through a landslip, of a new rapid on the Yang-tee, which is of sufficient importance to seriously impede navigation. It is situated in $30^{\circ} 54'$ north latitude, and in about $109^{\circ} 16'$ east longitude. The landslip appears to have been brought about by a lengthened period of rain. It is necessary to unload the cargoes of all junks which pass the rapid, and even when empty they can do so only with the greatest difficulty. When the river was at its lowest the ascent of the rapid was quite impossible.

AFRICA.

Recently published Documents on Sierra Leone.—The origin of the name of this English settlement is not yet a perfectly ascertained point. M. Eliseo Reclus rightly declares (in his *Nouvelle Géographie Universelle*) to be incomprehensible why the official English name is half Spanish (*Sierra*; why should it be Spanish?) and half Italian (*Leone*; "why should it be Italian?"). However, M. Reclus presents us the correct Portuguese form "*Serra-Leão*," while the 'Encyclopædia Britannica' assures us that it is "*Sierra Leona*." As a matter of fact, "*Serra Leão*," meaning the "*Lioness mountain*," is the right Portuguese name given, in the middle of the sixteenth century, to a mountainous peninsula on the west coast of Africa. M. Reclus, and many recent writers, wonder if the cause of such a name were the vague resemblance of the mountainous mass to a recumbent lion (Cantino represents it thus on his 1502 map, and this is the opinion adopted recently by Mr. A. H. Keane); or if Pedro de Cintra actually saw there a lion; or, again, if it were—according to Cadamosto—the thunderstorms reverberated by the littoral mountains that suggested the roaring of lions? A manuscript of the sixteenth century, recently published in Lisbon, seems to settle this point, as we have in it the opinion of the discoverer Pedro de Cintra himself. In his '*Esmeraldo de Situ orbis*' (liv. i. cap. 22, p. 57), written in 1505, Duarte Pacheco Pereira,

* Ramusio writes *Serra Lione*, the word *serra* being, in Portuguese, a feminine noun.

+ The pilot of Villa do Conde, whose narrative (1531 or 1532) Ramusio published, speaks of the thundering storms of *Serra Leão*, but does not say that its name was derived therefrom.

while giving a very interesting description of Serra Leôa, its geographical position and relations with Rio-Grande and the Cape Verde Islands, says, "Many think that this land was called Serra Lyoa on account of the existence of lions, but this is not true, for Pedro de Sintra, who, by the command of the *Infante* Dom Henrique, whose knight he was, discovered it, called it 'Lioness' for its rugged and wild appearance (*aspera e brava*), and not for any other reason; this must be taken for certain, as he himself told it to me." In the same chapter Duarte Pacheco gives some interesting information: "The natives (Bouloos [= Bullom, Bolama]) are only occasionally cannibals. There is gold in the country (especially at Oya), where the natives buy it for salt, and then exchange it to the white men for brass rings, barber basins, and red cotton goods. Elephants are numerous, . . . and wild men of the sort the ancients called Satyrs, entirely covered with long hair, and altogether like men in their ways, with the only difference that they scream instead of speaking when they are attacked, and live in the most recondite parts of the mountains [probably the gorilla, found at present further to the east]. . . . 12 or 16 leagues inland the Seuzos [Soso = Suzos] have much iron, which they bring to Serra Lyoa and other localities. . . ." Camões called Serra Leôa "very rugged" (*asperissima*),* but Duarte Pacheco Pereira calls the region handsome (*formosa*). King Dom Manuel had then a fort on the river Mitombo (Bakelie). Captain Alvarez de Almada, who explored the country in 1580, and wrote a very flattering memoir † on it, tried, about 1594, to establish a colony in Serra Leôa, which then enjoyed such a good reputation, or was so attractive on account of its picturesqueness, that the Portuguese governor of the island of Sant Yago (Cape Verde) dissuaded Alvarez d'Almada from his scheme, for fear all the inhabitants of the island should go over with him to the African continent. The territories of Serra Leôa were, however, the subject of a special royal grant in 1606, and of some subsequent legislation. Dr. Sousa Viterbo, the well-known Portuguese historian, has just published ‡ the interesting documents he, for the first time, brought to light from the Lisbon Archives of Torre do Tombo (*Chancellaria de Dom Philippe II. Douçes*, liv. 13, fol. 236). By a royal charter Philippe II. of Portugal (III. of Spain) granted the lands between Rio de Cassi (Scaroles), where ended the territories granted by another Portuguese royal chart, and Cabo das Palmas (being 140 leagues along the sea-coast, with all the adjacent islands) to Pedro Alvarez Pereira and his successors. By that concession were vested on Pedro Alvarez Pereira all administrative and judicial powers, together with the monopoly of all waterfalls, salt or other mines. He had the right to conquer and subdue all the native chiefs and races of the hinterland, the exclusive rights of commerce in the ports and rivers, and that of establishing settlements or even towns (not less, says the chart, than 6 leagues apart of each other), where, during the first fifteen years, he was obliged to have four hundred men, two hundred of them married, and accompanied by their wives and children, some of the colonists being agriculturists, and thirty masters in different crafts, with one physician and two priests. Alvarez Pereira had, moreover, to furnish the necessary ships for the commerce, and to build one church, three castles, in stone (one of

* "Deixando a Serra asperissima Leôa," *Lucinas*, cant. v., est. 12. Sir Richard Burton, under the influence of Cadamosto, "englished:"—"Leaving the rugged range where lions roar," but declares (without knowing Pacheco Pereira's *Esmeraldas*) that lions probably never existed there ('Camões, a Commentary,' vol. II, p. 614, 1881).

† "Tratado breve dos Rios de Guiné do Cabo Verde," etc. MS. of 1594 only published in 1733 and 1841 with a map.

‡ Os Portuguezes e o Gênio, Coimbra, 1896.

which in the port of Serra Leôa), and all the necessary fortifications against the natives and the pirates. The charter establishes the taxes he had to pay, including one-tenth of all incomes to the order of Christ and, to the king, the value of one fish in every twenty caught beyond 20 leagues from the coast. Pedro Alvarez Pereira had the right to introduce annually forty-eight slaves in Lisbon free from duty, and only to pay 1000 reis for each one exceeding that number, besides the right to employ slave labour in his ships. All the first explorers agree in considering Serra Leôa a charming place. The Portuguese Pimentels say in their *Roteiros* (of the seventeenth and eighteenth centuries) that it is "the healthiest spot in all Guinea." Dr. Sousa Viterbo publishes some documents concerning the laws against the Portuguese who chose to live with the African natives, adopting their costumes, superstitions, and even their dresses and tattooing. These especially selected Serra Leôa. This locality is, however, now well known as "the white man's grave."

Explorations in the Congo Basin.—The Congo State officers continue to reduce the area of unexplored country within the Congo basin by journeys of reconnaissance in the vicinity of their posts. During the latter months of 1896, Lieut. Brasseur, accompanied by Lieut. Carckel, completed the exploration of both the western and eastern branches of the upper Congo, and his journey is described in the *Mouvement Géographique*, 1897, Nos. 11-13. Starting from the station of Lofel, in Katanga, the explorers reached the Lualaba at Shimulou's village, where it was crossed by Le Marinel in 1891, and proceeded down its level and swampy valley as far as its junction with the Luapula. Cameron's report of a series of small lakes along the course of the river appears to be entirely confirmed, but it seems that they almost all lie off the direct course of the stream, forming as it were backwaters connected with the latter by channels. Lake Kisali (seen from a distance by Cameron in 1874) is, according to the maps given in the *Mouvement*, the only exception to this rule, as it is traversed by the main stream, and receives also the Lufira, or Lufila, on its south shore. This was known to Livingstone, who was the first to speak of the lake, so far back as 1868. The whole course of the Lualaba below Shimulou is open to navigation. Its valley is generally narrow, being bordered for a considerable distance by Lieut. Brasseur along its left bank. It is broken by a succession of rapids, which begin soon after its exit from Mwetu. At one point there is a fall of over 60 feet (that of Kanke). Lower down the river flows through a perfect chaos of mountains, which recalls the scenery of the neighbourhood of the Jao falls on the Lufira, being part of the same line of high ground. M. Wauters considers that Lieut. Brasseur's exploration confirms his idea (based on geological grounds, but coinciding with Cameron's previous statement) that the western branch is the true upper course of the Congo. Like M. Cornet, he holds that the Lualaba or Kamolondo valley was formerly occupied by a lake, which has been drained through the narrow pass discovered by Captain Hinde and Mr. Mohun. Officers of the Congo State (Lieuts. Lange and Long) have also, like the German Captain Ramsay, ascended the Rusizi river north of Tanganyika, and explored the east shore of Lake Kivu, where they have founded two stations (*Mouvement Géographique*, 1897, No. 8, with sketch-map). The Rusizi forms a succession of rapids, the most important fall being that of Pembe at its exit from the lake, where the mountains confine the stream within a narrow gorge, rising on the east side, in the peak of Dagore, to a height of nearly 8000 feet. The western shore of Lake Kivu is still unexplored. The third number of the *Mouvement Géographique* for 1897 contains the account of an exploration by M. Stache in the region between the Kasai and Sankuru rivers. After leaving the territory of the Bashilele, who dwell near the confluence of the two rivers, the traveller reached the Bakole, a

tribe which has borne the character of being hostile to Europeans, but which, though at first suspicious, allowed M. Stache to pass. Their most powerful chief is named Mianu. The people show many resemblances to the Bakuba, are tall and well made, and dwell in populous aggregations of villages. The farthest point reached was Galikoko, apparently in the Bakuba country. M. Stache is an agent of the Société Belge du Haut Congo.

Exploration of the Malagarazi.—The *Hentches Kolonialblatt* for February 15 last contains the account of an exploration of the lower course of the Malagarazi by Lieut. Fonck, who was sent for that object by Captain Ramsay after the establishment of the German station at Ujiji. Although the route from Tabora to Ujiji passes at but a small distance north of this part of the stream, no traveller had made a complete examination of its course, whilst such an examination was needed in order to prove whether it could be utilized as a means of communication between Ujiji and the salt wells on the Ruchugi, the output of which has lately reached large proportions. The boats in which Lieut. Fonck started up the stream from the head of its delta had soon to be left behind owing to obstructions to navigation, the mountains closing in on either side, and the bed of the river being strewn with rocks, between which the water flowed with great rapidity. Higher up two considerable falls were reached, the second of the two having a perpendicular height of over 50 feet. The banks were in great part uninhabited, and covered with jungle, traversed only by hippopotamus paths, so that the attempt to follow the river continuously was abandoned; but the number of rapids soon proved that in the dry season navigation would be possible only for short distances, whilst even at high water many difficulties would be met with. The various channels of the delta are shallow and obstructed with sandbanks, so that they could be navigated by craft of any size only in the rains.

African Trade.—Recent Consular Reports deal with the trade of Uganda, Suakin, and Beira respectively during the year 1896. Writing from Uganda, Mr. Berkeley reports an increase both in the bulk of trade and also in the demand for better-class goods, such as manufactured clothing, household utensils, etc. The export trade still consists exclusively of ivory, but the Waganda are becoming alive to the importance of fostering native products, such as coffee, rice, &c. The trade of Kavirondo (which centres at Mumia's) has likewise increased, thanks to the pacification of the country by Mr. Hobley, and caravans now go northwards beyond Elgon and into Turkania. In Uganda various efforts have been made to develop local resources. Skilled labour has been introduced for the working of saw-mills, with a view to the improvement of the native industry of carpentry. Practical experiments in cultivation have been made at Kampala, the best results having been obtained with rice, cotton, oil-seeds, and European vegetables. A thriving plantation of over 1000 coffee seedlings has been already formed by the agent of a European firm. At Suakin a decrease in every branch of trade is announced, owing to the interruption of trade routes, due to the expedition against the Dervishes. The decrease in the importation of grain was, however, due to the success attending the cultivation of the Baraka delta during the preceding season. Gum still remains the principal article of export. An exceptionally good harvest was secured in the Tokar district in 1896, consisting chiefly of durra and dukin. At Beira the trade during 1896 showed a considerable increase as compared with former years, due partly to increased landing facilities, the inauguration of agricultural enterprises, etc., and partly to temporary causes, such as railway construction and the introduction of troops. Scarcity of native labour, heavy import duties, and the want of a direct and regular steamship connection with England are mentioned as some of the principal hindrances to trade. The Manageries

Maritime Company has started a regular monthly service between Delagoa Bay and Beira, which is much patronized. The importance of British interests is, however, shown by the fact that most of the trade cargoes are imported in British vessels, the landing and railway companies are British, and the language employed in business is English. The British population is 120, second only to that of Portuguese nationality.

Surveys in German East Africa.—Extensive surveys have lately been carried out in the region of the lower Rufiji by Robert Hans Schmidt, of Vienna, acting under the orders of the government of German East Africa. Descending the stream in canoes, Herr Schmidt laid down on a map the various arms of the delta, afterwards exploring the little-known but picturesque mountains of Alamitibi, between the river and Kilwa. North of the Rufiji he discovered the small lake Lina, or Bunja, and fixed the position of the hot springs of Nyunguni. His map is based on forty astronomically fixed positions, and he has taken many altitudes and made extensive collections. Although the region bears a bad name for unhealthiness, Herr Schmidt enjoyed good health throughout. He is engaged in preparations for a new expedition, having for its object the determination of the boundaries of the various provinces of German East Africa, and the investigation of the best route to Lake Nyasa, especially with regard to the navigability of the Rufiji, Ulanga, and Ruaha.

M. Gentil's Mission to the Shari Basin.—Further news of this expedition (*Journal*, vol. viii, p. 517) is published in the *Revue Française* for April. M. Gentil is said to have reached the Nana, a southern tributary of the Shari, and to have transported the sections of his steamer to a station founded on its banks. A preliminary examination of the river indicated its suitability as a navigable channel towards the Shari and Lake Chad.

AUSTRALASIA AND OCEANIC ISLANDS.

The Atoll of Funafuti.—The local committee of the "Funafuti Coral Reef Boring Expedition" of the Royal Society, in charge of Prof. Sollas, suggested to the trustees of the Australian museum that one of their officers should be attached to the expedition, and Mr. Charles Hedley accordingly joined H.M.S. *Penguin* at Sydney in May, 1896. A general account of Mr. Hedley's observations, with special reports on rock-specimens and birds collected, is published by the museum (*Memoir III.*). Mr. Hedley's geological results cannot be better summarized than in his own words: "(a) An elevation of Funafuti by at least 4 feet is proved by dead sub-fossil reef-corals in the position of life near high water-mark. (b) Darwin's theory of coral reefs, as opposed to Murray's, is favoured by these facts:—Firstly, soundings show the atoll to be planted, not on a bank, but on a cone; secondly, they also show it girdled by a precipitous submarine cliff, explicable only on the subsidence theory; thirdly, our observations and the experience of residents agree that the lagoon is filling up, whereas Murray demands its excavation. (c) A peripheral growth at present level is indicated on both sides of the islets." Some notes on the climate indicate that its chief feature is constant humidity—so great that, for example, the drying of plant specimens in blotting-paper was hopeless, and botanical inquiry was therefore restricted to observations on plants used by the natives. The final section of the memoir, on the population, gives some account of the history of the people, their language, religion, and customs. Sixty years ago about thirty islets contained over 3000 people; unknown and terrible diseases, introduced by white men, had reduced this number to 160 in 1870, but an increase to 200 had taken place in 1882, and to 250 in 1896.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Cooling of the Earth as a Cause of Evolution.—The *Comptes Rendus* contain some further speculations by M. R. Quinton on the origin of life on the globe, and its successive stages under the gradual cooling at the surface. Life began, according to M. Quinton, under conditions of high temperature, and all animals reproduced oviparously. As the temperature became lower, certain species adapted themselves to the conditions; these are now represented by the cold-blooded animals. Others, again, did not so adapt themselves, and found that their eggs failed to hatch, unless "artificially" kept warm and supplied with food; hence the development of brooding animals, marsupials, mammals, etc.: the conditions requiring in the young increased heat and rate of growth to make up for and remove as soon as possible the disadvantage of great cooling surfaces compared with mass in the young individual. The continued cooling is thus a permanently active cause of evolution; without it neither bird nor mammal would have made its appearance, and the course of evolution is to be traced by a classification depending, not on community of habit or of habitat, but on similarity in mode of reproduction.

Evaporation and Drainage on Large Land Surfaces.—The fifth number of the fifth volume of the *Geographische Abhandlungen*, edited by Prof. Penck, just issued, contains two important papers, one on the rainfall and drainage of Bohemia by Dr. Vasa Rurac, and one really a discussion of Dr. Rurac's paper by Prof. Penck himself, on the general question of the relations between precipitation, evaporation, absorption, and drainage over closed areas of fair size, like Bohemia. As in the case of the extensive reports on the basin of the Oder, noticed in a recent number of the *Journal*, the bulk of the observations owe their existence to the inconvenience caused by floods and droughts, dating chiefly from the early sixties, when their connection with extensive deforestation of the mountain slopes first became disagreeably obvious. Dr. Rurac gives carefully compiled tables, based on data which he subjects to most rigorous examination, showing annual values of the following quantities: Water-level of the Elbe at Tetschen: date of formation and disappearance of ice at Leitmeritz, Anselg, and Tetschen; amount of water delivered by the Elbe at Tetschen, by the Moldau at Karolinenthal, the Little Elbe at Brandels, and the Eger at Laun; and the rainfall of Bohemia. The tables form another gratifying illustration of the increasing use of the method so successfully employed by Hann and Penck—of using the mean of a long period of observations merely as a starting-point for close examination of monthly or annual variations by approximate deductive methods, instead of the premature rigorous treatment so much in vogue a few years ago, when the reaction from the old average-worship first began. Prof. Penck's paper is a masterly application of the same method in more extended form to the problem of making out the details of a balance-sheet which may be summarized as follows: Drainage = precipitation — evaporation. To get a result in this simple form it is necessary to deal with a lengthened period, or, if this is not possible, to allow for certain intrusions with the capital account in the form of accumulations of or drainage from ground or surface water. There is, however, the further condition that these two latter are also ultimately equal. In Bohemia, the greater part of the 35.5 cubic kilometres of water precipitated annually is removed by evaporation, the amount being 25.5 cubic kilometres, equivalent to a rainfall of 600 mm. The heat required for this evaporation would melt an ice-sheet 3.75 metres in thickness, and corresponds to about 18 per cent. of the total radiant heat received under clear-sky conditions. The variations in amount of evaporation depend much more on variations of rainfall than of

temperature. The more rain falls in Bohemia the more water is removed by evaporation. Leaving wind out of account, the evaporation at any place depends on the amount of heat received—a function of its latitude which can be worked out with the help of Angot's radiation constants, giving the maximum possible evaporation. But on a land surface, evaporation can only go on when rain has fallen, and the more copious and frequent the rainfall within the ascertained limit, the greater the evaporation. The most favourable case is where the distribution of the rainfall corresponds to the annual variation of solar intensity, and it follows that two places in the same latitude with equal annual rainfall may give very different values for the amount of evaporation, while in a region with a definite type of rainfall-distribution the evaporation varies with the amount of rain. It is thus possible to find for any district limiting values of rainfall and evaporation which are equal, and if the rainfall at any time falls below this value for a long-enough period, there is no water to be carried off by drainage. Prof. Penck obtains a value between 220 and 250 mm. for the whole Elbe basin in Bohemia—370 to 400 mm. for the Moldau basin, and 300 mm. for the remainder. The final and most important result is that the amount of water removed by drainage is proportional, not to the total rainfall, but to the excess above the limiting value equivalent to evaporation. The effect of increased temperature is much smaller, a change of 1°C . Fahr. in the annual mean corresponding to an evaporation of 19 mm., or a rainfall of 36 to 40 mm. The relation between increase of rainfall and increase of drainage, or the "drainage-factor," varies for short periods between 22.5 and 31.4 per cent. in the different parts of Bohemia, depending on different conditions of the soil. The factor is smallest for an impermeable soil, because the water remains on the surface and is more exposed to evaporation, but on a sloping surface the water is carried off rapidly, and the factor increases with the rainfall. To sum up. There are thus five quantities to be taken into account: (1) the total precipitation, n ; (2) the limiting value of rainfall equivalent to evaporation, n_0 ; (3) the relation between increase of precipitation and evaporation, γ ; (4) the departures from mean temperature, t , and the relation between variations of temperature and of drainage, α ; (5) the quantity of water "in hand" at the beginning of the period considered, s' , and the amount added to or taken from that stock, s'' . The relation between these and the total water removed by drainage can be simply expressed by $A = (n - n_0)\gamma - \alpha s' + s''$. We heartily commend this paper to the careful consideration of engineers and agriculturists as well as geographers.

Soundings and Temperature Observations in the Faroe Channel.—

The Hydrographic Department of the Admiralty has just issued a report by Captain Moore of the work done by H.M.S. *Research* in the Faroe channel during August of last year. A large number of temperature observations were made at stations visited by H.M.S. *Arcturion* in 1893-94, and by H.M.S. *Knight-Erment* in earlier years, and particulars of these are given in the report, their discussion and the examination of numerous water-samples collected being left in the hands of the Fishery Board for Scotland, from whom we may expect to hear more. The work of H.M.S. *Research* in this difficult region is of the greatest possible value, and especially at the present time, when it forms part of a connecting link between the extensive survey of the North Atlantic being carried out by Mr. H. N. Dickson, and the simultaneous work of Prof. Pettersen and others off the west coast of Europe. Captain Moore's observations bring these two undertakings into close relation with one another, thereby greatly increasing the value of each, and they at the same time afford an opportunity of comparing the physical conditions of the water in a region like the Faroe channel at the same period of different years.

We look forward with much interest to the discussion of them in the pages of the Fishery Board Report, and we hope that H.M.S. *Research* will again help to complete the system of observations during this season. In an addendum to his report, Captain Moore gives a short discussion of the relative merits of Negretti and Zambra's and Cary's thermometers for deep-sea work. The conclusion arrived at is that the reversible thermometer in the Scottish frame is the more accurate, but that it is unsuitable for surveying work for various reasons, all connected with the messenger. It would seem that the objections to the messenger system are only valid where the loss of a set of observations involves much delay by reason of the great depth, precisely the conditions where the old Magnaghi frame is at its best, and the Scottish frame least necessary. Greater difficulties in the use of the reversing thermometer are not referred to by Captain Moore, viz. the slight variation of the point at which the column of mercury breaks, which seems inseparable from these instruments—even the best will sometimes give a reading considerably out—and the practical difficulty of getting a reversing arrangement easily "set off" when required, but certain not to do so when not required. We are glad to learn that, in the hands of the Danish oceanographers, the improved form devised by Dr. Martin Knudsen gives excellent results, but we hope before long to see some modification of the thermophone, or similar electrical instrument, which shall once for all dispose of all the clumsy apparatus at present in use.

Latitude and Longitude by the Gyroscope.—M. E. Durant-Gréville describes in the *Revue Scientifique* for March 27 an ingenious arrangement of two gyroscopes, by which the latitude and longitude of a ship or balloon may be obtained at any time and in any weather, whether the sky is clear or not. The gyroscopes, which it does not appear that the author has constructed or tested, would be kept in motion by an electric arrangement. That for longitude would be started with its axis parallel to the axis of the Earth, and, being suspended by a torsionless string, would give the latitude at any moment by reading the angle between the suspending (vertical) string and the heavy ring which keeps parallel to the plane of the equator. The gyroscope for longitude has to be set in motion with its axis in a plane parallel to that of the prime meridian; it is read in conjunction with the latitude instrument, and the result reduced by reference to a chronometer to allow for the rotation of the Earth. Whether this extremely ingenious application of the gyroscope will be practically useful remains to be proved.

GENERAL.

The Bishop of London on Regional Geography.—At the annual meeting of the London University Extension Society, held on April 3, in the Mansion House, the Lord Mayor in the chair, the Bishop of London (Dr. Creighton) gave an address entitled "The Study of a Country." He acknowledged that the title was vague and not fully satisfactory, but he wished to imply by it the study of our surroundings as a whole in all their natural complexity. As a rule the tendency of study was to abstract one aspect of a question from the others with which it was combined in nature, and, by concentrating intellectual attention on the artificially simplified problem, to destroy or discourage the faculty of mental alertness. He urged the importance of mental alertness in the affairs of practical life, and chose this title, "The Study of a Country," as a nucleus around which any knowledge one might acquire could be crystallized. In every country he recognized some sort of individuality, which, existent in the forms of its scenery, became impressed upon the character of its people. Familiarity dulled one's mental alertness to such an extent that the characteristic features of one's native country were very apt to pass unnoticed. The bishop stated that what had opened his eyes

to the characteristic beauty of English scenery, and to the causes which had created English life, was a journey in Russia. In Russia he realized what it was to live in the midst of the unbroken horizon of one vast unending plain. The feeling that one could go on for thousands of miles without perceptibly changing that horizon or the surrounding features produced a sense of monotony which could not be understood in England. The greatest countries of the world had always been small lands of varied scenery. Such lands were Palestine, Greece, Italy, and England. The great nations which had influenced the thought and civilization of the world, had all been formed under the same conditions, conditions in which the mind was stimulated to activity by the fact that it could so rapidly pass from one set of suggestions to another. The most remarkable natural feature in English scenery was its great variety and distinctness, and at the same time the beautiful gradations by which one form changed into another. Different aspects of a country appealed to different people, but each aspect, if pursued far enough, afforded abundant opportunities for the development of mental alertness. To one, the geology of a country opened up a vast system of possibilities of study, explaining the varieties of natural scenery and the causes of human aggregation and movement. To another, the study of architecture in one or all of its three great divisions, ecclesiastical, civil, and domestic, supplied the key to the life of the country. Through the architecture of buildings one could trace the march of historical events, and observe how the forms of buildings are dominated by the materials at the disposal of the architect. The variety and importance of English domestic architecture had not been at all realized. Even in a suburban walk it told much when the conventional modern rows of villas or flats gave way to a jumble of little old village houses, the inn, the general shop, and the smithy still visible, and pointing to the cause which had led the wave of population to approach and overflow the site. The bishop strongly urged on his audience the educational importance of the study of their native country.

The Third Cruise of the "Princess Alice."—Although the bulk of the work done by H.S.H. the Prince of Monaco, during his third season on the *Princess Alice*, is of a zoological tendency, it appears, from the account recently published in the *Comptes Rendus*, that results of great geographical interest have been obtained. The most important contribution to knowledge is probably the discovery of a bank near the Azores, to which the name *Princess Alice* has been given. This bank lies between $31^{\circ} 28'$ and $31^{\circ} 41'$ N. lat., and $37^{\circ} 50'$ and 38° W. long., in a north-west to south-east direction. Its circumference is about 40 geographical miles, the average depth below the surface 127 fathoms, rising in two summits to 104 and 41 fathoms, the bottom being rock and volcanic sand, with a rich and abundant fauna. Some interesting experiments were made with apparatus devised by Dr. J. Richard, the zoologist of the expedition, in particular a modification of Giesbriht's tow-net, and an arrangement for ascertaining whether the quantity of gases dissolved in sea-water is dependent on the pressure due to depth or not. The principle adopted in both cases is that of placing a "stop" on the sounding-line, letting it down to the depth at which it is desired to make the observation, and then allowing the instrument, previously "shut," to run down the line. On reaching the depth the instrument is "opened" by contact with the stop, and it can be shut again by sending a flag messenger from the vessel. Samples of water were collected over mercury with an arrangement of this kind, at depths of 550 and 1475 fathoms, and the analyses confirm earlier work to the result that the amount of gases dissolved in sea-water is independent of the pressure.

The Russian Geographical Society.—At the meeting of this Society, February 3, the yearly report was read and the medals awarded. Of the three

expeditions which were sent out by the society for the observation of the eclipse of the sun, two were favoured with good weather. The work of pendulum observations, which has been prosecuted for years by the society, was continued by A. I. Vilkitzky in North-West Siberia (Tobolsk, Berezov, Obdorsk, and on the shores of Yugor strait), as well as by M. Witram on the Amur, at Vladivostok, and Hong Kong; while M. Moureau, from the St. Maur observatory, near Paris, continued to explore the magnetic anomaly in Central Russia. The study of the raised sea-beaches and the post-Tertiary deposits in North-West Russia, which it is proposed to carry on for several years, was begun last summer by L. N. Zverintseff, in Esthonia, the St. Petersburg government, and Olonets; and the exploration of the Caucasian glaciers was continued by N. A. Bush and N. N. Schubkin. They visited forty-eight glaciers, of which thirty had never been visited before, and determined the altitudes of their lower ends; moreover, the former explored the tributaries of the Kuban river, while the second made entomological collections and photographs of the visited localities. The chief expedition which was out last summer was engaged in the exploration of the Hissar mountains, in the Bukhara Khanate. It was under V. V. Lipsky and I. S. Barachovsky. These hilly tracts, where the three chief tributaries of the Amu—the Surkhan, the Kahrnagan, and the Yakh—(as also the tributaries of the Zeravshan and the Kaahka-daria, take their origin, were almost quite unknown. The heavy snow, which covered the mountains this year, rendered the work of the expedition extremely difficult; but still very interesting surveys were made, several glaciers were mapped, and collections, botanical, zoological, and geological, as well as many photographs, were brought in. Another perhaps even more important expedition, under a mining engineer, M. Anert, and a botanist, V. Komaroff, was at work in Manchuria. M. Slunin worked in the same summer on the coasts of the Sea of Okhotsk, making interesting botanical collections and ethnographical observations. A fifth expedition for collecting popular songs, with music, was at work in the governments of Tashov and Panza, under Th. M. Istomlin and I. V. Nekrasoff; while S. G. Rybakoff was sent out to the provinces of Turgai and Uralak, in order to study the songs and music of the Kirghizes. The ethnography and antiquities of Volhynia were studied by M. Th. Krivoshepin; customary law, in Kostroma, by Th. I. Pokrovsky; the present conditions of the Telengates, in the Altai region, by A. A. Kalacheff.—The Constantine medal of the Society was awarded to the geologist Th. N. Chernysheff, for his many years' work on the geography and geology of Russia; and Count Lütke's medal to I. B. Spindler, for his eighteen years' geological work. The large gold medals were awarded, by the section of ethnography, to E. I. Yakushkin, for his large work on customary law; and by the section of statistics, to Th. Th. Busse, for his researches into the maritime transport of peasant emigrants to Russian Manchuria. The Prjevalsky premium was awarded to V. I. Lipsky, for his explorations in the Hissar mountains. Small gold medals, to M. Moureau, for magnetical measurements; to G. A. Luboslavsky, for meteorological work; and to A. Makarenko, for ethnographical work. The Prjevalsky medal was awarded to D. A. Klement, for his journeys in South Siberia and Mongolia. Fifteen silver and twelve bronze medals were awarded for various works of less importance.

The Force of Tropical Rains.—Professor Dr. Wieser, of Vienna, has recently published the results of some observations on the effects of tropical rain-showers, made in Buitenzorg and in Egypt. The great fall of leaves observed after the occurrence of such showers is commonly supposed to be wholly and directly due to the violent impact of the raindrops, but this is found to be only a secondary cause inasmuch as the leaves are ready to drop in any case, and only require a slight

touch to detach them. Professor Wiesner finds that the maximum amount of precipitation in such showers is at the rate of 0.04 mm. per second. We often read of drops 1 inch in diameter falling in tropical rains, but Professor Wiesner never obtained any weighing more than 0.26 gram, and then only from very low clouds. The average weight was 0.06 to 0.08 gram, although 0.16 gram was not uncommon. It is remarkable that the rate of fall (7 metres per second) is independent of the size of the drops.

Proposed Anthropological Study of the North Pacific.—*Science* for March 19 states that the American Museum of Natural History is about to undertake a systematic study of the peoples inhabiting the shores of the North Pacific Ocean between the Amur river and the Columbia river, the whole funds for the purpose being supplied by Mr. Morris K. Jesup, president of the museum. The work in the field is expected to extend over six years, and it will be carried on simultaneously in Asia and America. The aim of the investigation is to collect the fullest anthropological data bearing on the problem of a former interchange of peoples between the old and the new world, and so to determine, if possible, whether the primitive American culture was indigenous or derived from Asia. As an indication of the difficulties of the problem, it is stated that ten languages and thirty-seven mutually unintelligible dialects are spoken between the Columbia river and Bering strait, while on the Asiatic side there are at least seven languages and ten distinct dialects, and investigations will probably bring still more to light. Such a project is extremely creditable to American private enterprise, and it is not undertaken a day too soon. The urgent need of similar systematic anthropological work in the Pacific islands has more than once been brought forward, and it is greatly to be wished that some wealthy friend of science would emulate Mr. Jesup by establishing a simultaneous study of the Pacific archipelagoes which might elucidate the problem of Asiatic intercourse with South America in early times.

Dr. Nansen.—After delivering his farewell lecture in England, Dr. Nansen proceeded to Paris, where he was presented to the President of the French Republic on March 26. In the evening of the same day he was welcomed by the Geographical Society at a special meeting held in his honour at the Trocadéro, the largest building in Paris, and received the enthusiastic applause of an audience of fully six thousand persons. M. Bataillon, Minister of Education, presided, and, after paying a warm tribute of admiration to the great explorer, performed the ceremony of investing him with the insignia of Commander of the Legion of Honour. Dr. Nansen's lecture, read in French, and illustrated with lantern views, was listened to with close attention. In Berlin the explorer met with a no less cordial reception. A meeting of the Geographical Society was held in his honour in Kroll's Theatre on April 3, the Imperial Chancellor and other representatives being present. In the absence, through ill health, of Major von Wissmann, president of the Society, the chair was taken by Baron von Richthofen, vice-president. After the conclusion of the lecture, the announcement was made of the award to the explorer, on the part of the Emperor, of the great gold medal for science and art, and, on the part of the Geographical Society, of the gold Humboldt Medal, which has been previously bestowed on two explorers only, viz. Colonel Przhevalsky and Dr. John Murray. A banquet concluded the evening's ceremony. The following day Dr. Nansen lunched with the Emperor, and subsequently received an address of welcome from the city of Berlin. He afterwards proceeded to Copenhagen, where he was received and honoured by the king. Dr. Nansen has been presented by the British Government with a complete set of the *Challenger* publications, the only instance, we understand, in which such a presentation has been made to an individual.

OBITUARY.

Antoine d'Abbadie.

By E. G. RAVENSTEIN.

ANTOINE THOMAS D'ABBADIE, best known to geographers for his extensive explorations in Abyssinia, died in Paris on March 21. He was born at Dublin on January 3, 1810, of a French father and an Irish mother, and had thus attained the ripe age of eighty-seven years. His parents removed to France in 1818, and he thus received a careful scientific education.

When quite a young man, in 1835, the French Academy sent him on a scientific mission to Brazil, the results of which were published in '*Observations relatives à la physique du globe faites au Brésil et en Ethiopie*' (Paris, 1873).

In 1837, accompanied by his brother Arnauld, he started for Abyssinia, landing at Massawa in February, 1838. After a visit to Gondar he returned to France for a better outfit. He once more landed at Massawa in March, 1840, and between that date and October 4, 1848, when he finally left for Europe, he connected the place mentioned by what he terms an "expeditive triangulation" with Bonga, in Kafa, which he reached on November 30, 1843; having crossed the Abai on May 20. He crossed that river a second time on May 10, 1845, and visited the sources of the Gibe (Orno), which he looked upon as the true heart of the Nile. An attempt to reach Shoa from Zella, on the gulf of Tajura, was frustrated, as he alleges, through the intrigues of Captain Haines. There can hardly be a doubt that d'Abbadie exercised such influence as he possessed in Abyssinia in favour of France and of the Roman Catholic missionaries, but it seems unfair to blame him for the expulsion of the Protestant missionaries from Adowa. Far more serious was the charge brought against d'Abbadie's veracity by Dr. Beke, himself an Abyssinian explorer of great merit, who, in '*An Inquiry into M. d'Abbadie's journey to Kassa*' (London, 1850), expressed a belief that he had never been in that remote country. The literary quarrel thus originated culminated in Dr. Beke returning the gold medal which had been awarded him by the French Geographical Society. Time has done justice to M. d'Abbadie's high merits. His triangulation triumphantly stood the test applied to it by Captain Carter's surveys, made during the Abyssinian expedition, whilst more recent explorers of the countries lying to the south of the Abai have borne witness to the trustworthy character of the work done by him in this remote region. The topographical results of his explorations were published at Paris, 1860-73, in '*Géométrie d'Ethiopie*,' which gives the three co-ordinates of 867 places and itineraries for 863 days of travel, and is illustrated by ten maps. Another work, '*Géographie de l'Ethiopie*' (Paris, 1890), is mainly devoted to information derived from native sources, but only the first volume of it has been published. A description of 234 Ethiopian manuscripts collected by him will be found in '*Un Catalogue raconté de MSS. Ethiopiens*' (Paris, 1859). In addition to smaller vocabularies, d'Abbadie compiled a '*Dictionnaire de la langue Amharique*' (Paris, 1861). He also prepared an edition of the '*Pastor of Hermos*,' with a Latin version, 1860, and published numerous papers dealing with the geography of Abyssinia, Ethiopia entire, and ancient inscriptions.

Among his more recent labours should be mentioned the magnetic observations made by him in the course of several journeys to the Red Sea and the Levant ('*Reconnaissance magnétique*,' Paris, 1890), and on earth-tremors produced by the beating of the waves upon the shore.

PAbbadie was made a Knight of the Legion of Honour in 1850, elected a
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member of the Academy of Sciences in 1867, and of the "Bureau des Longitudes" in 1878. He died the possessor of considerable wealth, and, subject to the life interest of his wife, bequeathed an estate in the Pyrenees, yielding 40,000 francs a year, to the Academy of Sciences, on condition of its publishing within fifty years a catalogue of half a million stars.

CORRESPONDENCE.

Drifting Sands.

I HAVE read with much interest Mr. Vaughan Cornish's paper "On the Formation of Sand-Dunes," which appeared in the *Geographical Journal* for March. As I have devoted many years to the study of palæontology, and have already worked on the same lines as the author, and at some of the same places, viz. Poole Sandbanks, parts of the Cornish coast, etc., and experimented at the London Sand-blast Works, perhaps I may be permitted to refer to the results of a few observations of my own.

Mr. Vaughan Cornish, in the first part of his paper, states that "any increase in the force of the wind is accompanied by an increase in the size of grain which the wind can lift." My own observations show that this rule cannot be applied to the sands of the Poole Sandbanks, or the shell-sands of Cornwall: too much depends on the *form* and *density* of the grains.

The Poole sands are chiefly quartzose, but contain a large percentage of very small rounded grains representing the denser minerals. A wind may blow with sufficient force to remove, practically, all the quartz grains (large and small) from a given surface, while the *still smaller* denser grains (zircon, rutile, etc.) will be left behind, forming dark mottled patches on the sand.

I have frequently collected large quantities of sand, consisting almost entirely of denser grains, which have been separated by this natural process (*Research*, December, 1889, and vol. II. No. 14; *Nature*, April 18, 1890).

If, after the removal of the quartz grains, we watch the action of a stronger gust of wind, we may then see these smaller and denser grains lifted up and carried away.

Hence grains which are heavy, and present a small surface to the wind, require a stronger blast to remove them than do larger grains of less density.

In the case of drifted shell-sand, the grains are largely tabular, lenticular, or disciform. A blast of wind may strike such grains under their flat surfaces and carry them to great distances, while the same blast would not move rounded grains, of the same bulk and material, which rested beside them. I have repeatedly observed this at many places where shell-sands occur. I found, also, that a wind which would remove six pieces of paper, each an inch square, would not necessarily remove the same pieces of paper when rolled up into balls. Hence the motion of a sand-drift, and the distance to which it travels, may depend largely upon the prevailing form or shape of the grains, rather than upon their size or the strength of the blast.

Ceteris paribus, flat grains will travel greater distances in moving air than rounded grains, and I have noticed some remarkable instances of this in Cornwall, where rounded grains of "killas" have been practically freed (on the surface) from the associated tabular calcareous grains, which the wind had removed.

Many interesting experiments in this direction can be carried out at home by making use of the ordinary blowpipe blast.

C. CARDS-WILSON.

Castile, March 16, 1897.

P.S.—In regard to Sir Frederic Goldsmid's interesting reference to the musical sand of the *Rig-i-Rauân* (*Geog. Jour.*, April), and Major Evan Smith's remarks about the cause of the mysterious sounds emitted from these sands, some of your readers may like to know that musical notes may be artificially produced from certain sands which have been specially treated, as described by myself a few years ago (*Nature*, August 6, 1891). I am away from references at present, but believe that the *Rig-i-Rauân* was first visited by Sir Alex. Burnes in 1836. In my 'History of Musical Sand' (1888) I refer to his observations. The best popular, and most recent, article on the subject appeared in *Temple Bar* for September, 1895.—C. C. W.

In continuation of the discussion on this subject, General Barnard Lovett, R.E., C.B., writes from Dresden on April 8, in reference to his own personal experience—

"Recalling the time to mind (now twenty-six years ago), I think a well-collected Burmese gong represents the sound I heard very well as regards tone; but it was not a continuously sustained sound. As the Afghans and I, who formed line, squatting on the sand, shored our feet in regular cadence into the sand, a note of increasing volume was given out, and this was repeated during our progression down the sand-dune over a certain zone. My own idea is that the sound emitted is entirely due to the shape of the hill. The rays of vibration of the air caused by the movement of the sand are focussed, as it were, and set up a major vibration, which undulates into space and addresses itself to the human ear. I don't think the substance of the hill has anything to do with the production of these sounds; but this phenomenon can only be solved by a prolonged stay at the *Zarât*, and by making a very accurate contoured plan of the hill."

F. J. GOLDSMID.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1896-97.

Afternoon Technical Meeting, Wednesday, March 17, at 5 p.m.—Sir

CLEMENTS MARKHAM, R.G.S., President, in the chair.

The Paper read was:—

"Terrestrial Magnetism, with Special Reference to the Position of the Magnetic Poles." By E. A. REEVES, F.R.S., Assistant Map Curator.

Ninth Ordinary Meeting, March 22, 1897.—Sir CLEMENTS MARKHAM, R.G.S., President, in the Chair.

ELECTIONS.—Thomas Bates; Henry Albert Harris Dunford, C.E.; Richard Russell Holman; Captain Albert Victor Jenner (*Rifle Brigade*); William Etheldred Jennings; Fredrik Lowmædler; Lieutenant E. C. Lyndale-Reizoo, R.N. (retired); John Wesley Martin, J.P.; Samuel Symington, J.P.; Walter John Tanner; Henry Tones; Edward Toner; Linden Travers; Lieutenant E. T. Williams (11th Hussars); Colonel John Randal Wilmer (*Indian Staff Corps*).

The Paper read was:—

"The North Polar Problem." By the President.

Tenth Ordinary Meeting, April 12, 1897:—Sir JEREMYS MARSHAM, B.C.B., President, in the Chair.

ELECTIONS.—*Baron Adolff von Andree*; *Captain Crooner Ashburnham (King's Royal Rifles)*; *George Darrell Calkender*; *Spencer Custer*; *Henry Williamson Gore, M.A.*; *H. Arthur Doubleday*; *Henry Hoagwe*; *Joseph Hardy*.

The Paper read was:—

"Fourth Centenary of the Voyage of John Cabota, 1497." By the President.

The Royal Awards were announced.

The PRESIDENT said: I am sure every Fellow present will be glad to know that our Vice-President has returned safely. Sir George Goldie planned with remarkable skill and ability an expedition which he has carried out with complete success, the results of which will be beneficial to a vast population. My young friend Lieut. Vandeleur will also soon return. He has added to his laurels by doing most valuable work with Sir George Goldie, and I am glad to say that the Council has this afternoon awarded to Lieut. Vandeleur Sir Roderick Murchison's grant.

You will, I think, agree that we have all endeavoured to make Dr. Nansen's stay amongst us as pleasant as possible. You will be glad to hear that Her Majesty's Government has presented to the great explorer a very handsome present, viz. a complete set of the volumes of the *Challenger* Expedition. I may perhaps add that the surviving English Arctic officers have also presented Dr. Nansen with a complete set of ancient and modern works of Arctic exploration.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian, R.G.S.*

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academia, Akademi.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Edk. = Edkunda.
G. = Geography, Geographic, Geographia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mittheilungen.

Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selekab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the Journal is 10 x 6½.

EUROPE.

Austria—Osteia.

Globus 71 (1897): 133-142.

Kaindl.

Haus und Hof bei den Ruthenen. Mit einer Einleitung über den Namen der Ruthenen. Von Prof. Dr. Edmund Friedrich Kaindl. Czernowitz. With Illustrations.

The Ruthenes are of Ruthenian race.

Austrian Alps.

Stich. Trav. A. W. Berlin (1890): 1256-1277.

Freck.

Über den Gletscher des Radstädter Tauern. Von Prof. Dr. F. Freck.

Austrian Alps.

Schjerveing.

Der Pinzgau. Physikalisches Bild eines Alpenraumes. Von Dr. Wilhelm Schjerveing. Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Zehntes Band, Heft. 2. Stuttgart: J. Engelhorn, 1897. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. [132]. Map and Plates.

Baltic Pilot.

The Baltic Pilot, Part II., comprising directions for the Baltic Sea, including the Gulf of Finland and Gulf of Bothnia. Third Edition. London: J. D. Potter, 1896. Size $9\frac{1}{2} \times 6$, pp. xvi, and 484. Index Chart. Price 4s. 6d. Presented by the Hydrographic Office, Admiralty.

Belgium.

Mouvement G. 14 (1897): 37-38.

Le régime fluvial de la Belgique aux temps quaternaires. With Maps.

Belgium—Emigration. *B.S.R.G. d'Anvers* 31 (1897): 89-120.

Donnet.

Notes pour servir à l'histoire des émigrations antérieures des Anversois dans les pays d'Outre-Mer. Par M. Fernand Donnet.

Denmark—Sand-Dunes.

Steenstrup.

Meddelelse fra Dansk geologisk Forening. I. K. J. V. Steenstrup: Om Kibernes Vandring. Kjøbenhavn: F. Dreyer, 1891. Size $5\frac{1}{2} \times 6$, pp. 14. Illustrations. Presented by the Author.

Contains reproductions of maps of part of the Danish coast, showing dune-formation.

Europe—Sunshine.

König.

Abb. K. Leopoldinisch-Carolin. *Deutsch. A. Naturforscher* 67 (1896): 207-209.

Dauer des Sonnenscheins in Europa. Eine meteorologische Studie. Von Heinrich König. With Diagrams.

France.

Martel and Delebecque.

Sur les sources et l'hydrologie souterraine du Vercors (Drôme). Par MM. E.-A. Martel et A. Delebecque. [Paris, 1896.] Size 11×9 , pp. 4.

France—Adour.*B.S.G. Chim. Bordeaux* 20 (1897): 63-82.

Duffaut.

Les embouchures et les îles anciens de l'Adour ayant le XVI^e siècle. Par Ch. Duffaut. With Map.

This is the subject of a special note.

France—Jura and Vosges.

Delebecque.

Jura et Vosges. Feuilles de Lussac-Saupler, St.-Claude et Nantua. Les terraces quaternaires et les lacs du Jura français. Par M. A. Delebecque. Extraits du Bulletin des services de la Carte géologique de la France (Bulletin No. 55, Tome viii., 1896-1897). Size $10 \times 6\frac{1}{2}$, pp. 1. Presented by the Author.

On the glacial geology of the district named.

France—Lakes.

Delebecque.

Sur les lacs du littoral landais et des environs de Bayonne. Par M. André Delebecque. [Paris, 1896.] Size 11×9 , pp. 4. Presented by the Author.

Germany—Houses.*Globe* 71 (1897): 169-174.

Rhauna.

Der heutige Stand der deutschen Hausforschung und das neueste Werk Meitzners. Von Karl Rhauna. I. With Two Illustrations.

Greece.*Z. Ges. Ethn. Berlin* 31 (1896): 385-430.

Philippson.

Reisen und Forschungen in Nord-Griechenland. Von Dr. Alfred Philippson. IV. Teil. With Profiles.

Greece and Italy.*J. Anthropol.* 1. 26 (1897): 254-271.

Montelluz.

The Tyrrhenians in Greece and Italy. By Prof. Oscar Montelluz. With Plates.

Pre-classical chronology in Greece and Italy. By the same.

Iceland Coast.

Wandel.

Information relating to Currents, Ice, and Magnetism, with general remarks on the Navigation of the Coast of Iceland. By Lieut. G. F. Wandel, Royal Danish Navy, 1879. [Slightly altered in parts.] London: J. D. Potter, 1896. Size $10 \times 6\frac{1}{2}$, pp. 22. Price 8d. Presented by the Hydrographic Office, Admiralty.

These sailing directions are the first published for Iceland since 1822.

Italy.*Riv. G. Italiano* 3 (1896): 425-431, 482-508.

Frescura.

Geografia di cosa nostra. La Bruma. Del Professor R. Frescura.

- Italy—Stilly.** *Riv. G. Italiani* 3 (1896): 500-519. **Marinelli.**
 Alcune notizie sopra il lago di Pergusa in Sicilia. Del Prof. (Minto Marinelli)
 On the Lake of Pergusa, in Stilly.
- Italy—Stromboli.** [Ludwig Salvator.]
 Die Liparischen Inseln. Siebentes Heft: Stromboli. *Verag.* H. Merz, 1896. Size
 10½ x 13, pp. x. and 32. Map and Illustrations. Presented by H.F.H. the Arch-
 Duke Ludwig Salvator.
- Mediterranean—Cyprus.** *I.R. Colonial* 1. 28 (1897): 195-199. **Christian.**
 Cyprus and its Possibilities. By Charles Christian. [Abstract.]
- Russia.** *A travers le Monde, Tour du Monde (n.s.)* 3 (1897): 73-79. **Krafft.**
 Aux Balkans de Bulgarie. Par M. Hugues Krafft. With Illustrations.
- Russia—Finland.** *Finland* 13 (1896): 1-61. **Bergell.**
 Bidrag till kännedom om Södra Finlands kvartärs förändringar. Af Hugo
 Bergell. With Map and Illustrations.
 On the quaternary changes of level in South Finland, with an abstract in German.
- Russia—Volga.** *Rev. Scientifique* (4) 7 (1897): 397-401. **Varigny.**
 Les Pêcheries de la Volga. Par M. H. de Varigny.
- Spain—Pyrenees.** *R.S.O. Marseille* 30 (1896): 378-395. **Saint-Yves.**
 Dans les Pyrénées espagnoles. Par M. G. Saint-Yves.
- United Kingdom—English Topography.** **Milne.**
 The Gentleman's Magazine Library: Being a Classified Collection of the Chief
 Contents of the Gentleman's Magazine from 1731 to 1858. Edited by George
 Laurence Gomme. English Topography, Part ix. (Nottinghamshire, Oxford-
 shire, Rutlandshire.) Edited by F. A. Milne, M.A. London: Elliot Stock, 1897.
 Size 9½ x 6, pp. x. and 302. Price 7s. 6d.
- United Kingdom—Irish Channel.** *Contemporary Rev.* 71 (1897): 406-423. **Walker.**
 An Irish Channel Tunnel. By J. Ferguson Walker. With Map.
- United Kingdom—Lincolnshire.** **Wheeler.**
 A History of the Fens of South Lincolnshire, being a Description of the Rivers
 Witham and Welland and their Estuary, and an Account of the Reclamation,
 Drainage, and enclosure of the Fens adjacent thereto. By W. H. Wheeler. Second
 edition. Boston: J. M. Newcomb. London: Simpkin, Marshall & Co., [1896].
 Size 10 x 6½, pp. 489. 42, 8, 14, 15, 17, 2, 4, 31, and 6. Maps and Diagrams. Pre-
 sented by the Publisher.
 This will be specially useful.
- United Kingdom—Tide Tables.** **Harris and Goalen.**
 Tide Tables for the British and Irish Ports, for the year 1897: also the times and
 heights of High Water at full and change for the principal places on the Globe.
 By Captains H. H. Harris and W. N. Goalen. London: J. D. Potter [1897].
 Size 10 x 6½, pp. xi and 254. Price 1s 6d. Presented by the Hydrographic Office,
 Admiralty.
- ASIA.**
- Asiatic Turkey.** **Paterson.**
 From Bombay through Babylonia. By Rev. James Graham Paterson. Glasgow:
 D. Bryce & Son, 1896. Size 7½ x 5, pp. 292. Map and Illustrations. Presented
 by W. W. Hind Smith, Esq.
 A narrative of a missionary journey.
- China.** *A travers le Monde, Tour du Monde (n.s.)* 3 (1897): 81-84. **Bouin.**
 A travers le Yun-Nan, le Tibet et la Mongolie. Exploration de M. Ch. E.
 Bouin. With Illustrations.
- China Sea Directory.**
 The China Sea Directory. Vol. 1. Containing Directions for the Approaches to
 the China Sea, by Malacca, Singapore, Sunda, Banka, Guejar, Carimata, Rhio,
 Béréhala, and Durian Straits. Fourth Edition. London: J. D. Potter, 1896.
 Size 9½ x 6, pp. xxiv. and 614. Index Chart. Price 4s. Presented by the
 Hydrographic Office, Admiralty.
- India.** *J.S. Asia* 45 (1897): 345-374. **Elliott.**
 On Measures taken by Government for the Prevention of Plague in India. By
 Sir Charles A. Elliott, M.C.

India.**Fraser.**

British India. By G. W. Fraser, L.N. (The Story of the Nations Series.) London: T. Fisher Unwin, 1896. Size 8 x 5½. pp. xviii and 409. *Maps, Portraits, and Illustrations. Price 5s. Presented by the Publisher.*

A history of India from the invasion of Alexander the Great to the relief of Chitral, but the earlier centuries occupy only one short chapter, the greatest detail being given to the history of the East India Company, and the progress of India since its power was superseded. There is a map of India and several illustrations.

India—Andaman Islands.**Euchanan**

Report and Appendices on Forests situated around Stewart Sound, North Andaman. By E. M. Euchanan. Port Blair, 1895. Size 13½ x 8½. pp. (Report) 29, map; (Appendices) xxvi. *Presented by the Chief Commissioner of the Andamans and Nicobars.*

India—Andaman and Nicobar Islands.**Temple.**

Reports and Remarks on Tours of the Chief Commissioner, Andaman and Nicobar Islands, in September and October, 1894; January and February, and March and April, 1895. Size 13 x 8½. *Maps. Presented by the Chief Commissioner of the Andamans and Nicobars.*

A special note is given in the Monthly Record on these reports.

India—Assam.

Report on the Administration of the Province of Assam, for the year 1895-1896, Shillong, 1896. Size 17 x 8½. pp. xvi, 298, and cxxviii. *Map. Presented by the Secretary of State for India.*

India—Burma.

Tables for the Transliteration of Burmese into English, with Lists showing the names in English and Burmese of the Divisions, Districts, Sub-divisions, Townships, and Circles of Burma; also of the Post Offices, Railway Stations, Police Offices, and other places of interest. Rangoon, 1896. Size 10 x 6½. pp. xviii and 222. *Presented by the Quartermaster-General in India.*

India—Famines.*J.E. India Assoc. 29 (1897): 9-39***Cunningham**

Indian Famines. By Sir H. S. Cunningham, R.C.L.E. With Maps.

The maps show the distribution and area of the famine districts in 1832, 1837, 1851, 1860-61, 1865-66, 1868-69, 1873-74, and 1876-78.

India—N.-W. Provinces and Oudh.

Report on the Administration of the N.-W. Provinces and Oudh for the year ending March 31, 1896. Allahabad, 1897. Size 13½ x 8½. pp. (v. xxxvii) 158, (vi.) and 181. *Presented by the Secretary of State for India.*

India—Punjab.

Report on the Administration of the Punjab and its Dependencies for 1895-96. Lahore, 1897. Size 13½ x 8½. pp. xii, 238, and cxxx. *Map. Presented by the Secretary of State for India.*

This map shows the Punjab railways constructed up to 1896.

Korea.**Hamy**

Documents sur l'anthropologie de la Corée. Par M. E.-T. Hamy. Extrait du Bulletin du Muséum d'histoire naturelle, 1896, No. 4. Size 10 x 9½. pp. 4.

Malay Archipelago—Java.**Verbeek and Fennema.**

Description géologique de Java et Madoura. Par Dr. R. D. M. Verbeek et E. Fennema. Publié par ordre de son Excellence le Gouverneur général des Indes Néerlandaises. 2 vols. Amsterdam: J. G. Stander Ck., 1890. Size 10 x 7. pp. xlvii and 1184, plates. Atlas accompanying, size 22½ x 27. *Presented by the Minister of the Dutch Colonies.*

This fine monograph will be specially noticed.

Malay Archipelago—Lombok.**Cool.**

With the Dutch in the East. An outline of the Military Operations in Lombok, 1894, giving also a Popular Account of the Native Characteristics, Architecture, Methods of Irrigation, Agricultural Pursuits, Folklore, Religious Customs, and a History of the Introduction of Islamism and Hinduism into the Island. By Captain W. Cool (Dutch Engineers). Translated from the Dutch by E. J. Taylor. With a Copious Index, a small Glossary of foreign Words and Lists of Authorities quoted. London: Lusk & Co., 1897. Size 10½ x 7. pp. viii, 366, and viii. *Map and Illustrations. Price 21s. Presented by the Publishers.*

A special note will be given on this book.

- Malay Archipelago—Moluccas.** Hendrika.
Het Boornsch van Massarè. Door H. Hendrika, te Massarè (eiland Born).
Uitgegeven door het Koninklijk Instituut voor de Taal-, Land- en Volkenkunde
van Nederlandsch-Indië. 'S-Gravenhage, Martinus Nijhoff, 1897. Size 10 x 6½,
pp. 176.
- Paria.** J. Tysdale O.S.B. (1896): 311-320. Goldsmid.
Pecin and Her Neighbours (Part II.). By Major-General Sir Frederic J. Gold-
smid, F.R.S., &c.
- Philippine Islands.** Z. Ges. Erbk. Berlin 31 (1896): 369-372. Elementritt.
Neue Nachrichten über die Subanen (Insel Mindanao). Nach P. Francisco
Sanchez. Von Professor F. Elementritt.
- Philippine Islands.** B.S. d'Études colon 3 (1896): 257-280. Laval.
Les Îles Philippines. Par G. De Laval, avocat.
- Russian Central Asia.** (Rhus 71 (1897): 132-135. Vambery.
Bilder aus Samarkand. Von H. Vambery. With Illustrations.
- Syria—Damascus.** J.R.I. British Architects (B) 4 (1896): 25-40, 57-65. Spiers.
The Great Mosque of the Omeyyades, Damascus. By R. Phipps Spiers. With
Illustrations.

AFRICA.

- Africa—Journey across.** Misc.
Mouvement Anticolonialiste Belge 3 (1896): 242-247, 329-334, 357-362, 387-390.
La traversée du continent noir. Notes de voyage de M. F. Miss.
This crossing of Africa took place from the mouth of the Zambezi to the mouth of
the Congo.
- Africa—Political Division.** Hertslet.
The Map of Africa by Treaty. (Second and Revised Edition.) Vol. i. Abyssinia
to Great Britain (Colonies). Nos. 1 to 102. With amended Maps.—Vol. ii. Great
Britain and France to Zanzibar. Nos. 103 to 208. With amended Maps.—Vol. iii.
Appendix. Alphabetical Index, and Chronological List. With Two Maps. By
Sir Edward Hertslet, &c. London: Eyre & Spottiswoode, 1896. Size 10½ x 6½,
pp. xxviii. and 1078. Price 31s. 6d.
Some inaccuracies having been detected in the maps of the first edition of this work,
it was withdrawn from circulation, and the opportunity has been taken, in issuing it with
revised and accurate maps, to bring the whole work up to a later date, the chronological
index running down to November, 1895, the preface being dated February, 1896.
- Algeria.** J. Asiatique (19) 5 (1896): 351-391. Basset.
Notes sur le Chénoua de la province de Constantine. Par M. René Basset.
- British Central Africa—Lake Moero.** Mouvement G. 14 (1897): 27-29.
Le lac Moero et le delta du Loupula.
- British East Africa.** Macdonald.
Soldiering and Surveying in British East Africa, 1891-1894. By Major J. R. L.
Macdonald, &c. London: E. Arnold, 1897. Size 9½ x 6, pp. xvi. and 334. Maps
and Illustrations. Price 12s. Presented by the Author.
This will be referred to along with other books on Africa.
- British East Africa—Lake Albert Edward.** Mouvement G. 14 (1897): 13-18. Wauters.
Comment le bassin de l'ancien lac Albert-Edouard "a été rattaché
au bassin du Nil par la Soukiki. Deuxième Article. Par A.-J. Wauters. With
Map.
- Cape Colony—Kimberley.** Nature 65 (1897): 519-523. Crookes.
The Diamond Mines of Kimberley. By Dr. William Crookes, &c.
- Cape Colony—Kimberley.** Symon's Monthly Meteorolog. Mag. 32 (1897): 17-29. Sutton.
Sunshine at Kimberley, S. Africa. By J. R. Sutton, &c.
- Congo State.** B.S.R.G. d'Angers 21 (1897): 23-42. Danco.
Le Congo, conférence par M. P. Danco.
- Congo State.** Mouvement G. 14 (1897): 23-27. Stache.
De Bona-Bendi & Gullikoko (Kasai-Sankuru). Par E. Stache. With Illustrations.

- Egypt—Alexandria.** Franceschi.
Le climat d'Alexandrie comparé à celui du Caire. Par le Professeur Eugène Franceschi. Supplément au Bulletin No. 10, Série IV, de la Société Khédiviale de Géographie. Le Caire, 1896. Size 9½ x 6½, pp. 40.
- Egypt—Alexandria.** *Nineteenth Century* (1897): 437-445. Mahaffy.
About Alexandria. By Professor J. P. Mahaffy.
- German South-West Africa.** *Verh. Ges. Erdk. Berlin* 24 (1897): 103-113. Essex.
Herr Dr. Max Essex: Meine Reise nach dem Kanene im nördlichen Grenzgebiet von Deutsch-Südwest-Afrika. With Map.
- German South-West Africa.** *Verh. Ges. Erdk. Berlin* 24 (1897): 113-141. Hartmann.
Herr Premierlieutenant Dr. Hartmann: Das Kaoko-Gebiet in Deutsch-Südwest-Afrika auf Grund eigener Reisen und Beobachtungen. With Map and Illustrations.
- Morocco—Cape Juby.** *Scottish G. Mag.* 13 (1897): 115-120. Zaytoun.
Cape Juby. By Fird. S. Zaytoun, M.A., C.M.
- Portuguese East Africa.** *B.S.G. Lisbon* 15 (1896): 375-378. —
O Inhampallala. With Map.
- Sahara.** *B.S.G. Marseille* 20 (1896): 350-375. Foureaux.
Mes missions sahariennes de 1876 à 1896, conférence de M. F. Foureaux. With Map.
- Sahara.** *Deutsche Rundschau G.* 19 (1897): 254-266. Thilenius.
Die Expedition des Marquis de Moréa. Von Dr. G. Thilenius.
- Somaliland.** Smith.
Through Unknown African Countries. The First Expedition from Somaliland to Lake Lamu. By A. Donaldson Smith, M.A. London: E. Arnold, 1897. Size 10½ x 7, pp. xvi. and 472. Maps, Portrait, and Illustrations. Price 21s. Presented by Dr. J. Scott Keltie.
This will be noticed along with other books on Africa.
- South Africa.** *Rev. Scientifique* (4) 7 (1897): 193-203. Launay.
La prise de possession de l'Afrique australe. Par M. L. de Launay.
- South Africa.** *Nineteenth Century* (1897): 390-395. Villiers.
England's Advance North of Orange River. By Malins de Villiers.
- South Africa—Manika Land.** *B.G. Club Philadelphia* 2 (1896): 33-40. Farnum.
A Trip to Manika Land. By J. Edward Farnum. With Map.
- Tunis.** Hamy.
La Nécropole Berbère d'Hanchir el-Aasel près du Dar-el-Djaur (Tunisie). Par M. le Docteur E.-T. Hamy. (Extrait des Comptes rendus de l'Académie des inscriptions et belles-lettres.) (Paris, 1896.) Size 9 x 6, pp. 8.
- Upper Nile.** Marctonne.
La vie des Peuples du Haut-Nil, explication de trois cartes Anthropogéographiques. Par E. de Marctonne. (Extrait des *Annales de Géographie*) (Octobre 1896—Janvier 1897.) Paris: A. Colin & Cie. Size 10 x 6½, pp. 28. Maps. Presented by the Author.
This will be specially noticed.
- West Africa—Niger.** *C. R., S.G., Paris* (1897): 24-51. Hourat.
Réception de la Mission Hourat. Le Niger (de Tombouctou à l'embouchure du fleuve). With Map.

NORTH AMERICA.

- American Indians.** *J. Anthropol.* 1. 23 (1897): 221-247. Hale.
Four Huron Wampum Records: a Study of Aboriginal American History and Mnemonic Symbols. By Horatio Hale, M.A. (Harvard), etc. With Plates.
- America—the name.** Franciot-Legall.
L'Amérique a-t-elle droit sous ce nom à un nom indigène? Documents cartographiques. Documents linguistiques. Par N. Franciot-Legall. Paris: Ch. Chadeval, 1896. Size 9 x 6, pp. 88. Facsimile Maps. Presented by the Author.

- Canada.** **Bourinot.**
Canada. By J. G. Bourinot, C.M.G., etc. (The Story of the Nation.) London: T. Fisher Unwin, 1897. Size 8 x 5½, pp. xx. and 464. *Maps and Illustrations. Price 3s. Presented by the Publisher.*

A short and attractive history of Canada, published at a convenient time in view of the approaching meeting of the British Association at Toronto.

- Canada.** *J. Tyaside G.S.* 3 (1897): 283-299. **Smith.**
The Resources of Canada. By Sir Donald A. Smith, O.C.M.G. (High Commissioner for Canada). With Portrait.

- Canada—Geological Survey.**
Summary Report of the Geological Survey Department for the year 1896. Ottawa, 1897. Size 10 x 6½, pp. 144.

- Great Lakes.**
No. 108. [U.S.] Hydrographic Office. Sailing directions for the Great Lakes and connecting waters. Washington, 1896. Size 9½ x 6, pp. 242. *Maps. Presented by the U.S. Hydrographic Office.*

With maps of the currents in the great lakes.

- Labrador and Baffin Land.** **Tarr.**
Evidence of Glaciation in Labrador and Baffin Land. By Ralph S. Tarr. [From the *American Geologist*, vol. xix., March, 1897.] Size 10 x 6½, pp. [8]. *Plate.*
Some fine photographs of rocks onestones are here reproduced.

- Mexico—Maya Inscriptions.** **Goodman.**
Biologia Centrali-Americana. . . . Edited by F. DuRoi Godman and Osbert Salvin. Archaeology. [Part viii., February, 1897.] Appendix: The Archaic Maya Inscriptions. By J. T. Goodman. London: R. IL Porter. Size 12 x 10½, pp. x. and 156.

This part contains the preliminary labours of an American specialist, forming a section of a joint work with Dr. Gustav Eilen, at which they have long laboured. It gives many details of the inscriptions relating to dates, and discusses the Maya calendar in great detail.

- North America—West Coast.** **Maclear.**
Sailing Directions for the West Coasts of Central America and the United States Compiled . . . by Rear-Admiral J. P. Maclear. London: J. D. Potter, 1896. Size 9½ x 6, pp. xi. and 482. *Index Charts. Price 3s. Presented by the Hydrographic Office, Admiralty.*

Treats of the west coast of Central America, Mexico, and the United States as far as Cape Flattery.

- United States.** *P. Boston S. Nat. Hist.* 27 (1896): 185-193. **Batchelder.**
Some Facts in regard to the Distribution of Certain Mammals in New England and Northern New York. By Charles F. Batchelder.

- United States.** *National G. Mag.* 8 (1897): 49-57. **Best.**
The Utilization of the vacant Public Lands. By Emory P. Best.

- United States.** **Maitland.**
The Geological Structure of Extra-Australian Artesian Basins. By A. Gibb Maitland. [Read before the Royal Society of Queensland, April 17, 1896.] Size 8½ x 5½, pp. 25. *Sections. Presented by the Author.*

This paper deals with the Artesian basins in North America.

- United States—Appalachians.** *J. School Geography* 1 (1897): 33-41. **Semple.**
The Influence of the Appalachian Barrier upon Colonial History. By Ellen C. Semple.

- United States—Bureau of Navigation.**
Navy Department. Annual Report of the Hydrographer to the Bureau of Navigation for the Fiscal Year ending June 30, 1896. Washington: 1896. Size 9½ x 6, pp. 20.

- United States—Coast and Geodetic Survey.** *Science (N.Y.)* 5 (1897): 384-388. **Survey.**
The Coast and Geodetic Survey. By J.
A powerful criticism of the present administration of the U.S. Coast and Geodetic Survey.

- United States—Massachusetts.** *P. Boston S. Nat. Hist.* 27 (1896): 159-161. **Bangs.**
An important addition to the Fauna of Massachusetts. By Ostrum Bangs.
- United States—Montana.** *B. American G.S.* 25 (1896): 287-291. **Brower.**
The Utmost Waters of the Missouri River. By J. V. Brower. With Chart and Illustrations.
- United States—New England.** **Henry.**
U.S. Department of Agriculture, Weather Bureau. Bulletin No. 19. Report on the Relative Humidity of Southern New England and other localities. Prepared under the direction of Willis L. Moore. By Alfred J. Henry. Washington: Weather Bureau, 1896. Size $9\frac{1}{2} \times 6$, pp. 24. *Diagrams.*
- United States—Oregon.** *American J. Sci.* (4) 3 (1897): 165-172. **Diller.**
Crater Lake, Oregon. By J. S. Diller. With Illustration.
A paper by the same author with the same title and with a map appears in the *National Geographic Magazine*, vol. 8 (1897), pp. 39-48.
- United States—Oregon.** *Deutsche Rundschau* G. 19 (1897): 193-208. **Höll.**
Der Mount Hood im nordamerikanischen Cascaden-Gebirge. Von Dr. Julius Höll in Darmstadt. With Illustrations.
- United States—Texas.** *P. Boston S. Nat. Hist.* 27 (1896): 149-158. **Marcou.**
The Jura of Texas. By Jules Marcou.
- United States—Virginia.** **Arnold.**
Johns Hopkins University Studies in Historical and Political Science. Fifteenth Series. I.—II. History of the Tobacco Industry in Virginia from 1800 to 1891. By B. W. Arnold, Jr., M.A., Baltimore, 1897. Size 10 x 9 $\frac{1}{2}$, pp. 86.
- United States—Washington Observations.** **Marsh.**
Washington Observations, 1894.—Appendix L. Magnetic Observations at the United States Naval Observatory, 1894. By C. C. Marsh, Lieut., U.S. Navy. Washington: 1895. Size 11 $\frac{1}{2} \times 9\frac{1}{2}$, pp. 114. *Plates.* Presented by the U.S. Naval Observatory.
Includes a description of the U.S. Naval Observatory at Washington, which was removed to its present position in 1893.

CENTRAL AND SOUTH AMERICA.

- Argentine Republic.** *Globus* 71 (1897): 165-169. **Ambrosetti.**
Die Entdeckung megalithischer Denkmale im Thale Tiff. (Prov. Tucumán der Argentinischen Republik.) Von Juan B. Ambrosetti. Buenos-Aires. Zeichnungen von Federico Volmer. With Illustrations.
- British Guiana—Cuyuni River.** *Times* (s.s.) 10 (1896): 310-324. **Hillhouse.**
Up the Cuyuni in 1887. By William Hillhouse.
- British Guiana—Potaro River.** *Times* (s.s.) 10 (1896): 225-256. **Lloyd.**
On the Potaro. By C. A. Lloyd.
- Chili.** *Verh. Ges. Erdk. Berlin* 24 (1897): 70-71. **Polakowsky.**
Neue Forschungsreisen im südlichen Chile. Von Dr. H. Polakowsky.
- Chili—Andes.** *Sitzb. Preuss. A. W. Berlin* (1896): 1161-1171. **Morricke.**
Geologisch-petrographische Studien in den chilenischen Anden. Von Dr. W. Morricke.
- Nicaragua Canal.** *Z. Ges. Erdk. Berlin* 21 (1896): 278-283. **Polakowsky.**
Der Nicaragua-Kanal. Von Dr. H. Polakowsky.
- Peru—Eastern Rivers.** *B.S.G., Lima* 5 (1896): 427-434. **Garrajal.**
Navegabilidad de los rios orientales del Peru. Por el Capitán de Navío M. Melitón Garrajal. With Map.
The rivers referred to are the Marañon, Ucayali, and their tributaries.
- Peru—Lake Titicaca.** *P. Philograph, S. Glasgow* 27 (1896): 147-150. **Wilson.**
Viel to Lake Titicaca, Peru. By Mr. John Wilson.
Description of the transport of a 550-ton steamer from the Clyde to Lake Titicaca. The steamer was shipped in sections, landed at Mollendo in lighters, and taken by rail to this lake.

- Peru—Lima.** *B.S.G. Lines* 6 (1896): 43-46. **Carvajal.**
La batida de Lima. Por el Capitán de Navío M. Melitón Carvajal.
 After discussing all the recorded determinations of the latitude of Lima, the author arrives at $12^{\circ} 2' 58.7''$ S. as the position of the south tower of the cathedral at Lima.
- Salvador.** *Petermann's M.* 43 (1897): 1-7. **Sapper.**
Vulkan in Salvador und Südost-Guineamala. Von Dr. K. Sapper. With Map.
- South America.** *B.S.G. Tables* 15 (1896): 263-328. **Mendes.**
América austral. Cartas escritas da America nos annos de 1882 a 1883. Por A. Lopes Mendes. Terceira parte.
- Venezuela.** *J. Tynesida O.S.* 3 (1896): 300-310. **Curtis.**
Venezuela: Her Government, People, and Boundary. By William E. Curtis. With Illustrations.
- Venezuela—Boundary.**
Venezuelan Boundary—General Arbitration. Correspondence between the United States and Great Britain. [1896.] Size 15×8 , pp. 50. Presented by the United States Government.

AUSTRALASIA AND OCEANIC ISLANDS.

- Australasia.** *J.S. Arts* 45 (1897): 300-302. **Bonwick.**
The Progress of the British Colonies of Australasia during the Sixty Years of Her Majesty's Reign. By James Bonwick.
- Central Australia—Horn Expedition.** **Winnecke.**
South Australia. Journal, etc., of the Horn Scientific Exploring Expedition to Central Australia. (With plates and plans.) 1894. By C. Winnecke, Leader of the Expedition, Adelaide, 1896. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 32. 2 Copies—one presented by Mr. C. Winnecke, the other by the Secretary of State for the Colonies.
- German New Guinea.** *Vorb. Ge. Erdk. Berlin* 24 (1897): 51-69. **Lauterbach.**
 Herr Dr. Carl Lauterbach: Bericht über die Kaiser Wilhelm-Land-Expedition im Jahr 1896. With Map.
- New Hebrides—Fusafuti.** *P.H.S.* 60 (1897): 502-512. **Sollas.**
 Report to the Committee of the Royal Society appointed to investigate the Structure of a Coral Reef by Boring. By W. J. Sollas, p.c., etc. With Illustrations.
- New South Wales.**
The Snowy Mountains and Mount Kosciusko. The Cooma Railway and Murrumbidgee District, New South Wales. [Sydney, 1896.] Size 9×6 , pp. 16. Map and Illustrations.
- Queensland.** **Jack.**
 Queensland. Department of Mines. Geological Survey. Bulletin No. 4. Notes on the Present Condition of the Hodgkinson Gold Field. By Robert L. Jack. Brisbane, 1896. Size 9×6 , pp. 16.
- Tahiti.** *Rev. Française* 22 (1897): 129-142. **Mager.**
Grandeur et décadence des établissements de Tahiti. Lettre de M. H. Mager.
- Victoria—Statistics.**
Statistical Register of the Colony of Victoria, etc., 1894. Melbourne. Size $13 \times 8\frac{1}{2}$.
- West Australia.**
Western Australian Statistics of Gold Output. Reprinted by permission of the *Statist and Australian Mail*. London: Printed by Sir Joseph Causton & Sons, 1896. Size 5×8 , pp. 66.
- West Australia.** *Deutsche Rundschau* G. 18 (1896): 356-366. **Mayr.**
West-Australien. Von Emil Mayr. With Map.
- West Australia—Israelite Bay.** **Brooke.**
Natural Features of Israelite Bay. By J. P. Brooke.—Report of the Sixth Meeting of the Australasian Association for the Advancement of Science, held at Brisbane, Queensland, January, 1895. Sydney. Size 9×6 , pp. 561-569.

POLAR REGIONS

- Antarctic.** *Rev. Scientifique* (4) 7 (1897): 329-334. **Hellprin.**
 Les régions antarctiques. Par M. A. Hellprin.
 Translated from the *Popular Science Monthly*.

- Arctic.** **Barton.**
 Evidence of the Former Extension of Glacial Action on the West Coast of Greenland and in Labrador and Baffin Land. By George H. Barton. [From the *American Geologist*, vol. xviii, December, 1896.] Size 9½ x 6½, pp. [6]. Presented by the Author.

- Arctic—Erosion.** **Tarr.**
 Rapidity of Weathering and Stream Erosion in the Arctic Latitudes. By R. S. Tarr. [From the *American Geologist*, vol. xix, February, 1897.] Size 10 x 6½, pp. [6]. *Plates. Presented by the Author.*

Professor Tarr brings forward evidence of the remarkable power of surface water in eroding the land in Arctic regions, drawing his illustrations mainly from Baffin Land and Greenland.

- Arctic—Ice limits.** *C. Rd. S. G. Paris* (1897): 9-16. **Babot.**
 Les limites des glaces flottantes autour du Spitzberg et de la Nouvelle-Zemble pendant l'été 1894, d'après les renseignements fournis par des capitaines norvégiens. Rapport présenté à la Commission centrale de la Société de Géographie. Par M. Charles Babot. With Sketch-Maps.

- Arctic Sea Ice.** *American J. Sci.* (4) 3 (1897): 223-229. **Tarr.**
 The Arctic Sea Ice as a Geological Agent. By Ralph S. Tarr.

- Polar Exploration.** *Petermanns M.* 43 (1897): 15-18. **Supan.**
 Unbekannte Polargebiete. Kurze Betrachtungen zur Karte der Grenzen der unbekannten Polargebiete. Von Prof. Dr. A. Supan. With Map.

The map gives a quantity of interesting relations between the exploration of the Arctic and Antarctic regions, and the amount of work done in successive centuries.

- Spitzbergen and Novaya Zemlya.** **Barry.**
 Zwei Fahrten in das nördliche Eismeer nach Spitzbergen und Novaja Zemlja unternommen von Sr. Kön. Hoheit Prinz Heinrich von Bourbon, Graf von Baudouin an Bord der österreichischen Jachten "Fleur de Lys I. und II." des k. und k. Jacht-Geschwaders in den Jahren 1891 und 1892, geschildert von Richard Ritter von Barry, k. und k. Linienschiff-Lieutenant. Im Auftrage des k. und k. Reichs-Kriegs-Ministeriums (Marine-Section) herausgegeben von der Redaction der Mittheilungen aus dem Gebiete des Seewesens. Pola: Carl Gerold's Sohn, 1894. Size 10 x 6½, pp. viii, 170, and 66. *Portraits, Maps, and Illustrations. Price 3s.*
 A record of two yacht cruises along the west coast of Spitzbergen to beyond 86° N., accompanied by maps and numerous plans of bays, and followed by a full meteorological log.

MATHEMATICAL GEOGRAPHY.

- Artificial Horizon.** *Ann. Hydrographiques* (2) (1896): 255-300. **Schwerer.**
 Instructions théoriques et pratiques sur l'horizon gynécopique dans le vide de M. le contre-amiral Fleuriot. Par M. A. Schwerer. With Plates.

Artificial horizons carried by a gynécopie in *vacuo* have been experimented with on some of the vessels of the French navy. This paper fully describes the instrument, and gives a complete description of the manner of using it.

- Cartography.** *Ann. Hydrographiques* (2) (1896): 29-39. —
 Rapport sur les règles à adopter pour les légendes des feux sur les cartes.
 On the new symbols authorized in 1895 by the French Marine for representing the different classes of lights on charts.

- Cartography.** *G. Z.* 3 (1897): 65-70. **Hammer.**
 Die Kartennutzentziffer. Von Prof. E. Hammer.
 On the construction of various map-projections.

- Clock-Halo.** *Rev. Scientifique* (4) 7 (1897): 240-243. **Houssier.**
 Pourquoi les cadrans de nos horloges sont-ils divisés en deux. Par M. Houssier.

Map of the World.

Barbier.

Projet de Carte de la Terre à l'échelle de 1/1,000,000. Rapport présenté au Congrès de Lorient. Par J.-V. Barbier au nom de la Commission technique de la Société de Géographie de l'Est. Nancy: Imp. Berger-Lévrault et Cie., 1896. Size 9 x 6, pp. 20. *Map. Presented by the Author.*

Positions.

Rev. Scientifique (4) 7 (1897): 394-397.

Durand-Gréville.

Détermination du point sans sextant. Par M. E. Durand-Gréville.

A note is given on this paper.

Surveying.

Clancey.

Aid to Land-Surveying (Small Edition), in English and Burmese; accompanied by 237 illustrations on the subject, and containing numerous useful tables. By J. C. Clancey. Third Edition. Revised and Enlarged. Rangoon, 1896. Size 12 x 8½, pp. iv., 80, [140], 26, 8, 6, and 10. *Presented by the Author.*

Surveying—Tables.

Clancey.

Calculating Tables in English and Burmese for use in Burma. By J. C. Clancey. Third Edition. Revised and Enlarged. Rangoon, 1896. Size 15 x 8½, pp. 252 and 10. *Charts, etc. Presented by the Author.*

Time and Angles.

Rev. Scientifique (4) 7 (1897): 15-19.

Rey-Faillade.

Projet d'extension du système décimal aux mesures du temps et des angles. Par M. J. du Rey-Faillade.

Time Standards.

J. Manchester G.S. 11 (1895): 248-254.

Greenwood.

"Unification of Time" as it Relates to the Practice of the Science of Navigation. By Mr. W. Nelson Greenwood.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Atmospheric Refraction.

Deleboque.

Sur les réfractions extraordinaires observées au bord des lacs et connues sous le nom de Fata Morgana. Par M. André Deleboque. [Paris, 1896.] Size 11 x 9, pp. 4. *Presented by the Author.*

Climate.

Zenker.

JbA. K. Leopoldsdorfer-Carolin. Deutsch. A. Naturforscher 67 (1896): 1-252.

Der thermische Aufbau der Klimate aus den Wärmewirkungen der Sonnenstrahlung und des Bodenerwärmens. Von Dr. W. Zenker. *With Maps.*

An investigation of the joint influence on climate of solar and internal Earth heat.

Coral Atolls.

Nature 55 (1897): 390-393.

Wharton.

Foundations of Coral Atolls. By Rear-Admiral W. J. L. Wharton, R.N., F.R.S. *With Plan.*

Cosmogony.

C. Rd. 123 (1896): 1094-1097.

Quinton.

Le refroidissement du globe, cause primordiale d'évolution. Note de M. R. Quinton.

Density of Earth.

Richarz, and Krigar-Menzel.

Sitz. K.P.A. Wiss. Berlin (1895): 1303-1318.

Gravitations-constants und mittlere Dichtigkeit der Erde, bestimmt durch Wägungen. Von Prof. Dr. Franz Richarz und Dr. Otto Krigar-Menzel.

Oceanography.

Makarov.

Le "Vityaz" et l'Océan Pacifique. Observations hydrologiques faites par les officiers du la corvette "Vityaz" pendant un Voyage autour du Monde, exécuté de 1886 à 1889, et recueillies des observations sur la température et la poids spécifique de l'eau de l'Océan Pacifique Nord. Par le Contre-Amiral S. Makarov. 2 vols. (in 1). St.-Petersbourg, 1894. Size 12 x 8½, pp. (vol. i.) xlv. and 338; (vol. ii.) 312. *Maps and Plates. Presented by the Russian Admiralty.*

This important work will be referred to in the Monthly Record.

Oceanography.

Thoulet.

Océanographie (Dynamique). Première partie. Par M. J. Thoulet. Paris: L. Bachelier, 1896. Size 10 x 6½, pp. 182. *Maps and Diagrams. Price 4s.*

A special notice of this work will be given when it is complete.

Oceanography—Apparatus.

Richard.

Sur un appareil destiné à démontrer que la quantité des gaz dissous dans les grandes profondeurs de la mer est indépendante de la pression. Par M. Jules Richard. [Paris, 1896.] Size 11 x 9, pp. 4. *Illustration.*

Oceanography—Faeroe Channel.

Moore.

Reports of Proceedings in connection with investigations into the physical conditions of the water of the Faeroe Channel. By Captain W. V. Moore, R.N., H.M.S. *Research*, 1896. Hydrographic Department, Admiralty, London. Size 13½ x 9, pp. 32. *Chart and Diagrams.*

A note on this Report will appear in the Monthly Record.

Pacific—Balfour Shoal. *Scottish G. Mag.* 13 (1897): 120-124.

Murray.

Balfour Shoal: a Submarine Elevation in the Coral Sea. By John Murray, F.R.S., of the *Challenger* Expedition. *With Chart and Diagrams.*

Sub-lacustrine ravines.

Delbecque.

Les ravins sous-lacustres des lacs glaciaires. Par A. Delbecque. Extrait des *Archives des Sciences physiques et naturelles. Quatrième période, t. i.* Mai 1896. Genève. Size 9 x 6, pp. 4.

Some evidence to confirm M. Forl's theory of the formation of ravines in the bed of lakes at the entrance of glacial rivers.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.**Anthropology**

Hamy.

Dr. E.-T. Hamy. *Les races Malaises et Américaines. Leçon d'ouverture du Cours d'Anthropologie du Muséum d'Histoire Naturelle (19 Mars 1896). Extrait de "l'Anthropologie." T. vii. No. 2.* Paris, Masson et Cie. (1896). Size 10 x 6½, pp. 18. *Presented by the Author.*

Anthropology—Gypsies.

Corra.

Prof. Guido Corra. *Die Zigeuner.* Turin (1895). Size 10 x 7, pp. 100. *Presented by the Author.*

Prof. Guido Corra has reprinted from *Asiatica* a series of papers on the Gypsies of Europe. Out of a total of 772,000 European Gypsies it appears that Rumania contains no less than 250,000, Hungary comes next with 150,000, the United Kingdom is credited with 12,000, and Norway and Sweden with 1500.

Exploration.

Fortnightly Rev. (n.s.) 81 (1897): 556-567.

Salmon.

1497-1897: East and West. By Edward Salmon.

Touchees on the voyage of Cabot and other pioneer voyages of the fifteenth and sixteenth centuries.

Historical—Discovery of America.

Batalla-Reis.

The supposed Discovery of South America before 1492, and the Critical Methods of the Historians of Geographical Discovery. By J. Batalla-Reis. From the *Geographical Journal* for February, 1897. Size 10 x 6½, pp. 26.

BIOGRAPHY.**Daubrée.**

Rev. Scientifique (4) 7 (1897): 321-329.

Meunier.

L'œuvre scientifique de M. A. Daubrée. Par M. Stanislas Meunier.

Engel.

Deutsche Rundschau G. 19 (1897): 280-282.

Dr. Ernst Engel. *With Portrait.*

Dr. Engel, who died in December, 1896, was for many years identified with the Statistical Department of the Kingdom of Saxony.

Goode.

Science (n.s.) 5 (1897): 365-378. Adler, Langley, and Osborn.

Goode Memorial Meeting. By Cyrus Adler.

George Brown Goode. By S. P. Langley.

Goode as a Naturalist. By Henry F. Osborn.

Rhine.

Deutsche Rundschau G. 19 (1897): 223-225.

Wolkenhauser.

Julius Detrouil de Rhine. Von W. Wolkenhauser. *With Portrait and Map.*

Bohlfs.

Deutsche G. Blätter 19 (1896): 165-182.

Wolkenhauser.

Gerhard Bohlfs. Von Dr. W. Wolkenhauser.

- Simony.** *G.Z.* 2 (1896): 657-662. **Pouchen.**
Friedrich Simony. (Feb. 29, Nov. 1815—gest. 20. Juli 1896.) Von Dr. K. Pouchen.
- Thomson.** **Thomson.**
Joseph Thomson, African Explorer. A Biography by his brother (Rev. J. G. Thomson, Greenock), with contributions by friends. London: Low & Co., 1896. Size 8 x 8½, pp. x. and 358. *Portrait, Maps, and Illustrations.* Price 7s. 6d. *Presented by the Publishers.*
This will be specially noticed.
- Waiting.** *Science (n.s.)* 5 (1897): 399-402.
Henry L. Whiting.
Mr. Whiting was long engaged on the United States Coast Survey, and on the Massachusetts Survey.
- Zehden.** *Deutsche Rundschau* G. 19 (1897): 278-289.
Dr. Karl Zehden. *With Portrait.*

GENERAL.

- Admiralty—Catalogue of Charts, etc.**
Catalogue of Admiralty Charts, Plans, and Sailing Directions, 1897. London: J. D. Potter. [1897]. Size 11 x 7½. pp. 254. *Price 1s.* *Presented by the Hydrographic Office, Admiralty.*
- Bibliography—English Catalogue.**
The English Catalogue of Books for 1896. Giving full titles classified under Author and Subject in one strict alphabet, with particulars of the Size, Price, Month of Publication, and Name of Publisher of the Books issued in Great Britain and Ireland in 1896, and the principal books published in America. Being a continuation of the 'London' and 'British' Catalogues. London: Low & Co., 1897. Size 10½ x 6½, pp. 224. *Price 5s.*
- Book of Reference—Statesman's Year-Book.** **Keltie and Kenwick.**
The Statesman's Year-Book. Statistical and Historical Annual of the States of the World for the Year 1897. Edited by J. Scott Keltie, with the assistance of E. P. A. Kenwick, M.A., LL.B. London: Macmillan & Co., 1897. Size 7½ x 5, pp. xxxvi. and 1168. *Maps.* *Price 10s. 6d.* *Presented by the Publishers.*
The thirty-fourth annual publication of this invaluable compendium is appropriately provided with a series of double maps, showing the political divisions of Europe, Asia, Africa, North America, South America, Australasia, the British Empire, and Foreign Colonial possessions in 1897 and 1897 respectively. The usual comparative tables of the countries of the world, and the carefully revised statistics of each country and colony are, if possible, more complete than before.

NEW MAPS.

By J. Coles, *Map Curator, R.G.S.*

EUROPE.

- Balkan Peninsula.** **Kiepert.**
Gemeinkarte der Süd-ost-Europäischen Halbinsel (Unter-Danub. und Balkan-Länder, Königreich Hellas und Creta). Bearbeitet von Heinrich Kiepert. Scale 1:1,500,000 or 22°7' inch. miles to an inch. Zweite berichtigte Ausgabe mit Eisenbahnmachtungen bis 1897. Berlin, 1897. Dietrich Reimer (Ernst Vohsen).
- Creta.** **Spratt.**
Die Insel Candia oder Creta. Reduction der vom Hydrographischen Office in London, 1862; publizierten, 1862 durch Capt. Spratt so. aufgearbeiteten Karte im 2. Blatt. Scale 1:500,000 or 7°9' inch. miles to an inch. Geographische Vervollständigung Dietrich Reimer (Ernst Vohsen), Berlin.
At the present time these two maps will be useful for reference. On the latter, the place where the Greek troops landed, and the harbours guarded by the warships of the combined powers, are indicated. The administrative divisions are laid down, and some notes are given on the orthography.

England and Wales.

Publications issued since March 3, 1897.

1-inch—General Maps:—

ENGLAND AND WALES:—256, 270, 274, revised, engraved in outline; 263, 222, 258, 268, 271, 314, revised, hills engraved in black or brown, 1s. each.

25-inch—Parish Maps:—

ENGLAND AND WALES:—**Durham** (revision), XIII. 11; XIV. 15; XXIV. 10; XXV. 12; XXVI. 5, 9; XXVII. 2, 3, 4, 5, 6, 7, 8, 9, 11; XXVIII. 1, 2, 3, 4, 5, 6, 7, 8; XXIX. 3, 3a, each. **Essex** (revision), XXXII. 11, 12; XXXIII. 1, 3, 5, 6, 7, 9, 10, 11, 12, 13, 15, 16; XXXIV. 1, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15; XXXV. 5; XLIII. 4, 9; XLIV. 13, 14, 15; XLV. 15; L. 5, 9; LI. 4, 8; LIII. 2, 5, 9; LIV. 5, 9, 10, 11; LVII. 2, 6; LVIII. 2; LIX. 4; LXI. 10; LXII. 13; LXX. 11; LXXIV. 6, 7, 11, 15; LXXV. 10, 14; LXXVI. 4, 5, 8, 9, 11, 13; LXXVII. 9, 12, 13; LXXXIII. 6; LXXXIV. 1, 3, 6, 7, 9, 10, 13, 3a, each. **Hampshire** (revision), XX. 12; XLVI. 13, 14; XLVII. 16; XLVIII. 4; XLVIII. 13, 15, 16; XLIX. 12, 16; LII. 14; LIV. 1, 2, 3, 5, 6, 7, 9, 10; LIVa. 4; LV. 5, 6, 10, 12, 13, 14, 15, 16; LVI. 15; LVIII. 14; LIX. 2; LX. 4, 8, 12; LXIV. 2; LXVI. 1, 11, 12, 14; LXVII. 2, 15, 16; LXVIII. 2, 3, 5, 7, 9, 10, 11, 3a, each. **Kent** (revision), XII. 4, 12, 13, 16; XV. 15 and 16; XVI. 9; XX. 2, 3, 4, 7, 8, 11, 12, 13, 15, 16; XXVII. 8; XXIX. 4; XXX. 16; XXXIX. 5, 9, 10; XI. 2, 16; L. 4, 7, 8, 12, 13, 16; LI. 5, 9, 11, 13, 15, 16; LII. 4, 8; LIX. 2; LX. 5, 6; LXI. 1, 2, 5, 10. **Middlesex** (revision), VIII. 1; XII. 14; XVII. 9; XXI. 7; XXIV. 15, 19; XXV. 6, 3a, each. **Northumberland** (revision), LX. 6, 10, 11, 12, 14; LXI. 9, 10, 11, 12, 13, 14; LXIII. 12; LXVIII. 2; LXX. 8; LXXI. 4, 12; LXXII. 2, 4, 5, 7, 9, 10, 11, 13, 14, 15, 16; LXXIII. 1, 2, 5, 9, 11 and 15, 13, 14; LXXXIX. 3; LXXX. 1, 2, 3; LXXXI. 1, 2, 11, 12 and 15; LXXXIX. 1, 2, 4, 5, 6, 9; CVIII. 12, 3a, each. **Surrey** (revision), V. 9; IX. 15-16; XIa. 19; XX. 5, 6, 7, 9, 10, 13; XXI. 1, 9, 16; XXVIII. 10, 14; XXX. II, 12; XXXII. 14; XXXIII. 12; XXXIV. 7, 8; XXXV. 5, 8, 11, 12; XXXIX. 13, 16; XL. 4, 12, 15 and XLVII. 3; XLI. 6, 12; XLII. 5, 10; XLIII. 9. **Sussex** (revision), II. 10, 12, 16; III. 6, 8, 9, 10, 13, 14, 15; IV. 9, 9; XII. 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; XXI. 8, 3a, each.

(E. Stanford, Agent.)

England and Wales.**Bartholomew.**

Bartholomew's Tourists' map of England and Wales. Scale 1 : 633,600 or 10 stat. miles to an inch. J. G. Bartholomew & Co., Edinburgh, 1897. 2 sheets. Price 2s. each, mounted on cloth. Presented by the Publishers.

These two maps include the whole of England and Wales, and Scotland south of Edinburgh, and the east coast of Ireland. As they have been prepared for the use of tourists and cyclists, special attention has been devoted to means of communication. All main roads are coloured brown, and the height above sea-level of some places are given.

England and Wales.**Bartholomew.**

Bartholomew's Reduced Ordnance Survey of England and Wales:—**Corwall** and **North Wales**. Scale 1 : 125,720 or 2 stat. miles to an inch. By John Bartholomew, r.a.s. 1897. J. G. Bartholomew & Co., Edinburgh. Price 2s. each, mounted on cloth. Presented by the Publishers.

These two maps form part of the reduced Ordnance Survey series in course of publication by Bartholomew & Co. Roads suitable for cyclists and driving are distinguished from other roads by being coloured brown, with the elevations given at intervals. The map of Cornwall is topographically coloured, and in the map of North Wales the hills are shown by shading.

Germany.**Königl. Preuss. Landes-Aufnahme.**

Karte des Deutschen Reiches. Scale 1 : 100,000 or 1½ stat. mile to an inch. Sheets: 354, Bücklinghausen; 355, Dortmund. Herausgegeben von der Kartogr. Abteilung der Königl. Preuss. Landes-Aufnahme, 1896. Price 1.50 marks each sheet.

Greece, Crete, etc.**Johnston.**

Maps of Greece, Crete, etc., to illustrate the Eastern Question. By Messrs. W. & A. K. Johnston. Edinburgh & London, 1897. Price 1s. coloured. Presented by Messrs. W. & A. K. Johnston.

This sheet contains seven maps and plans, which have been prepared with special

reference to the political situation in the East. The principal map is one of Greece, and includes the Turkish frontier. Maps of Turkey in Europe and Bulgaria and Crete are also given.

Norway.

Norges Geografiske Opmaaling.

Topografisk Kart over kongeriget Norge. Scale 1: 100,000 or 1-8 stat. mile to an inch. Sheets: B 26, D 6, H 17, I 16, I 17, I 18, K 17, K 18, U 3, Z 5, Æ 1, Ö 5, Ö 6. Norges Geografiske Opmaaling, Christiania. Presented by the Norges Geografiske Opmaaling.

Schulthess.

Switzerland.

Maps and Plans illustrating the proposed Jungfrau Railway. 8 sheets and letterpress. Zurich: Friedrich Schulthess, 1897.

This portfolio contains a series of maps, plans, and diagrams in connection with the proposed Jungfrau railway, which it is intended to carry to an altitude of 13,670 feet. In furtherance of this design the preliminary studies have been made, and are embodied in the letterpress which accompanies the maps and plans.

AFRICA.

German East Africa.

Klapert and Moisel.

Karte von Deutsch-Ostafrika. Scale 1: 200,000 or 1-7 stat. miles to an inch. Sheets: D 5, Mpápwa; D 6, Dar-es-Salaam. Berlin: Geographische Verlagshandlung Dietrich Reimer (Ernst Vohsen).

These two sheets include the country lying between lat. 3° 30' S. and 7° S. from the East Coast to long. 36° E. All the principal routes of travellers are shown, and the latest reliable material has been employed in their compilation.

AUSTRALIA.

South Australia.

Surveyor-General's Office, Adelaide.

Plan of the Southern Portion of the Province of South Australia, 1896. Scale 1: 1,000,000 or 15-8 stat. miles to an inch.—Map of South Australia, showing Public Works under the Engineer-in-Chief's Department. To accompany Report of the Engineer-in-Chief, for the year ending June 30, 1896.—Plan showing Route traversed by the South Australian Stock Route Expedition from Oodnadatta, S.A., to Coolgarlie, W.A., commanded by Mr. S. G. Hübner, under authority of the Crown Lands Department, Adelaide, S.A., 1896. Scale 1: 1,000,000 or 15-8 stat. miles to an inch. 2 sheets.—Plan showing Route traversed by the South Australian Stock Route Expedition from Coolgarlie to Encla, W.A., commanded by Mr. S. G. Hübner, under authority of the Crown Lands Department, Adelaide, S.A., 1896. Scale 1: 1,000,000 or 15-8 stat. miles to an inch.—Plan showing Pastoral Leases and Claims in the Northern Territory of South Australia. Scale 1: 1,000,000 or 15-8 stat. miles to an inch. 3 sheets. Surveyor-General's Office, Adelaide, S.A. Presented by the Surveyor-General of South Australia.

Western Australia.

Department of Lands and Surveys, Perth, W.A.

Map of Western Australia, 1896. Scale 1: 1,318,000 or 25 stat. miles to an inch. 4 sheets.—Map of Western Australia, 1896, showing electoral districts. Scale 1: 1,318,000 or 25 stat. miles to an inch. 4 sheets.—Map of Western Australia, 1896. Scale 1: 3,893,300 or 60-5 stat. miles to an inch. Department of Lands and Surveys, Perth, W.A. Presented by the Department of Lands and Surveys, Perth, W.A.

GENERAL.

Historical.

Poole.

Historical Atlas of Modern Europe from the Decline of the Roman Empire, comprising also maps of parts of Asia and of the New World, connected with European History. Edited by Reginald Lane Poole, M.A., F.R.S. Part vi. Oxford: the Clarendon Press. London, Edinburgh, and Glasgow: Henry Frowde. Edinburgh: W. & A. K. Johnston. 1897. Price 3s. 6d. each part. Presented by the Clarendon Press.

Part vi. of this atlas contains the following maps: No. xxvi. Scotland, showing the Ecclesiastical Divisions during the Middle Ages, with explanatory letterpress by G. Gregory Smith, M.A. No. xxviii. The Frankish Dominions in Carolingian Times, with explanatory letterpress by Reginald Lane Poole, M.A., F.R.S. No. ix. The Spanish Kingdoms, 1263-1492, by the late Ulrick R. Burke, M.A.

School Atlas.

Melin.

Atlas Melin. Historique et géographique spécialement établi pour les Cours de

l'Enseignement Secondaire. Nos. 2 and 3. André Paris, Editeur. À Montlus-sur-Ailier.

The first part of this atlas was noticed in the *Geographical Journal*, December, 1895. Each of the two parts now issued, like the first, is divided into two sections. No. 2 contains, in the historical section, maps and notes on the history of France and Europe from the year 1270 to 1610, and in the geographical section, maps of Europe with a general description of the several states. In No. 3, the historical portion has reference to the history of Europe and France between the years 1395 and 1270, and the geographical section contains maps of Africa, Asia, and Oceania.

This atlas has been specially prepared for educational purposes, and each map is accompanied by letterpress.

The World.

Vivien de Saint-Martin and Schrader.

Atlas Universel de Géographie. Ouvrage commencé par M. Vivien de Saint-Martin et continué par Fr. Schrader. France en 6 feuilles; feuille VI. Archipel Asiatique. Paris: Librairie Hachette et Cie.

These two sheets are the latest additions to the 'Atlas Universel,' which has been so many years in course of publication. Like all the other maps of this atlas which have been published, they are beautiful specimens of cartography.

CHARTS.

Admiralty Charts.

Charts and Plans published by the Hydrographic Department, Admiralty. January and February, 1897.

No.	Folios.		
2668 m = 2-9		Turkey in Asia:—Mersina coastland.	1s. 6d.
422 m = 1-7		Newfoundland, west coast:—Port au Port.	2s. 6d.
2856 m = 3-63		Lake Erie:—Buffalo harbour and head of Niagara river.	1s. 6d.
468 m = 2-4		North America, east coast:—Fisher's Island sound.	1s. 6d.
2850 m = 4-8		Plans on the south coast of San Domingo:—San Pedro de Macoris bay.	1s. 6d.
2197 m = 0-65		Ceylon, north coast:—Point Pedro to Delft Island (plan, Kankasatural anchorage).	2s. 6d.
1353 m = 0-15		Sumatra, north-east coast:—Diamond point to Palo Berhala (plan, Deli river).	1s. 6d.
2732 m = {3-6 1-8}		Eastern archipelago:—Plans of anchorages in Bali, Lombok, Sumbawa, and adjacent islands.	
2416 m = 0-35		Japan:—Liu Kiu Islands (plan, Kerama channel and anchorages).	2s. 6d.
2265 m = 6-0		Japan:—Kobe and Hyogo bays.	1s. 6d.
470 m = 0-2		Eastern archipelago:—Aru islands.	1s. 6d.
382 m = 0-5		Fiji islands, north part:—Vanua Levu with Makougal and Koro.	2s. 6d.
474 m = 1-0		Tonga or Friendly Islands:—Nanuka Islands, Haapel group.	2s. 6d.
2317		Tana fiord to Varanger fiord:—New plan, Vadsø havn. Plan added, Bras havn.	
2276		Bonin point to Sharopov point:—New plan.	
1115		Yu chau fu to Kwei-chau-fu:—Plan added, Tungting lake.	
982		Truk or Hugu Islands:—Plan added, Loap Islands.	

(J. D. Potter, agent.)

Charts Cancelled.

No.		Cancelled by	No.
1663	Plan of Head harbour or Pic à Denis on this sheet.	New Chart.	
		Port au Port . . .	422
336	Plan of Buffalo harbour on this sheet.	New Chart.	
		Buffalo harbour and head of Niagara river . . .	2856
1353	Diamond point to North sands.	New Chart.	
		Diamond point to Palo Berhala	1353
1355	North sands to Singapore.		
2416	Liu Kiu Islands, southern portion.	New Chart.	
		Liu Kiu Islands . . .	2416
2265	Kobe and Hyogo bays.	New Chart.	
		Kobe and Hyogo bays . . .	2265

Charts that have received Important Corrections.

No. A to P, index chart (16 sheets) 2, British Islands. 2268, England, south

coast:—Portland harbour. 2255, England, south coast:—Weymouth and Portland. 2484, England, east coast:—London to Gravesend. 2451, England, east coast:—River Thames, Broadness to Mucking light, etc. 1677, England, east coast:—Sunderland harbour. 2220, Norway:—Sveinøer to Kember islands, etc. 2751, Spitzbergen. 2360, Sweden:—Cape Fahlstedt to Kalmar sound. 173, Baltic sea:—Approaches to Helsingfors and Sveaborg. 1770, Baltic sea:—Port of Libau. 897, Bermuda:—From the Narrows to Hamilton. 350, Bermuda islands. 2042, Cape Breton island:—Sydney harbour. 1651, Nova Scotia, Prince Edward island, and part of New Brunswick. 2608, North America, east coast:—St. John's to Halifax, etc. 2457, North America, east coast:—Portsmouth harbour. 2882, North America, east coast:—Gloucester harbour. 2427, North America, east coast:—Salmon harbour, Marblehead and Beverley harbours. 2755, North America, east coast:—Long Island sound, sheet 2, western part. 2479, North America, east coast:—Black rock and Bridgeport harbours. New Haven harbour. 2470, North America, east coast:—Connecticut river. 2806, North America, east coast:—Charleston harbour. 2551, North America, east coast:—St. Helena sound to Charleston harbour, etc. 268, North America, east coast:—Cape Fear to Sapelo sound. 528, Gulf of Mexico:—Port of Vera Cruz and anchorage of Anton Lizardo: Port of Vera Cruz; Alvarado harbour. 1638, Gulf of Mexico:—Breton sound to Dernière island, including delta of the Mississippi. 2881, Gulf of Mexico:—Key West harbour and approaches. 2807, Gulf of Mexico:—Tampa bay. 1924, South America, east coast:—Rio de la Plata to Rio Negro. 1300, Plans on the coast of Chile. 1310, Plans on the coast of Peru. 2531, United States, west coast:—Cape Mendocino to Vancouver island. 385, British Columbia:—Harbours in the strait of Georgia. 583, British Columbia:—Sydney inlet to Nitinat, etc. 1862, Africa, west coast:—Lokki to river Doda. 981, Africa, east coast:—Lindi river; Mgan Mwanja. 49, India, west coast:—Korchi harbour. 455, India, west coast:—Port of Bombay. 2621, India, west coast:—Bombay harbour. 2284, Plans of anchorages on the west coast of Sumatra. 210, Sumatra, west coast:—Aethio head to Diamond point. 2510, Cocon or Keeling islands. 1065, Tong-King gulf:—Kua Lacht to Kao Tao shan islands, etc. 1282, China:—Hongkong to gulf of Lian tung. 2920, Australia, east coast:—Cape Direction to Cape Grenville. 2768, North-east coast of New Guinea, with Bougainville, New Britain, New Ireland, Admiralty islands, and off-lying reefs. 1400, Solomon islands:—Guadalcanal and Florida islands, etc. 769, Pacific ocean:—Admiralty and Hermit islands. 905, Fiji islands:—Suva harbour to Levuka. 1249, Fiji islands:—Ovalau and Moturiki islands. 765, Pacific ocean:—Tokelau (Union group).

(J. D. Potter, Agent.)

Norwegian Charts

Spezialkart over den Norske Kyst fra Ny Høllemsund til Lindesnes.—Spezialkart over den Norske Kyst fra Lindesnes til Lister.—Spezialkart over den Norske Kyst fra Lister til Rugefjord og Nævnag.—Spezialkart over den Norske Kyst fra Nævnag til Ognå.—Spezialkart over den Norske Kyst fra Gjølvingerne til Dolmunde. Scale 1: 50,000 or 6.8 stat. miles to an inch. Norges Geografiske Opmaaling, Christiania. Presented by the Norges Geografiske Opmaaling.

United States Charts.

Pilot Charts of the North Atlantic and North Pacific Oceans for March, 1897. Published at the Hydrographic Office, Washington, D.C. Presented by the U.S. Hydrographic Office.

PHOTOGRAPHS.

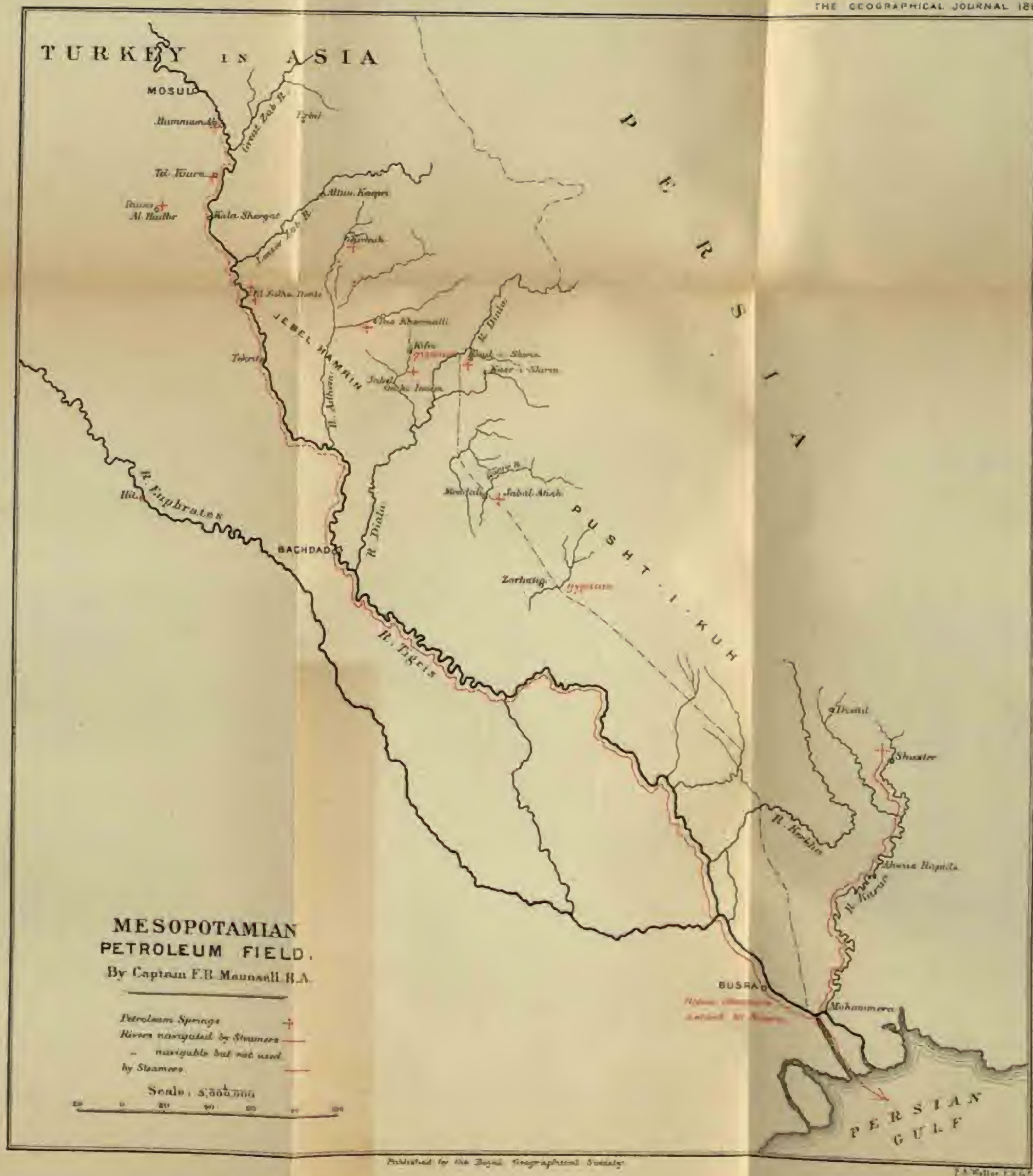
Afghan-Baluchistan Boundary.

Tate

Sixteen Photographs of the country in the neighbourhood of the Afghan-Baluchistan boundary, taken during the expedition of the Boundary Commission, 1886, by G. P. Tate, Esq. Presented by G. P. Tate, Esq.

This is an interesting series of photographs taken by Mr. G. P. Tate, Government Surveyor, on the borders of Afghanistan and Baluchistan. They convey an excellent idea of the scenery, buildings, and antiquities of the country.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.







SKETCH MAP SHOWING
ROUTE OF THE 'FRAM'
AND NANSEN'S AND JOHANSEN'S
SLEDGE JOURNEY.

The Dark Blue indicates Open Water
The Light Blue indicates Drift Ice
Unexplored Regions left white.

— Route of the 'Fram' in Open Water
— The 'Fram's' Drift in the Pacific
— Nansen & Johansen's Sledge Journey





PHYSICAL CHART OF
NORTH POLAR REGIONS

1897
BY J. G. BARTHOLOMEW F.R.S.E.
COMPILED FROM LATEST SOURCES INCLUDING DR. NANSSEN'S DATA

Scale of Statute Miles 1:1400000

NOTE Dashed lines indicate boundaries of various countries as shown on the map. Extensive areas of floating ice. Limits of Polar ice. Routes marked by explorers & others. Routes marked by explorers & others.	NOTE Dashed lines indicate boundaries of various countries as shown on the map. Extensive areas of floating ice. Limits of Polar ice. Routes marked by explorers & others. Routes marked by explorers & others.
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Printed by the 'Polar' in Open Water. The 'Polar' in the Polar Ice. Nansen's & Johansen's Bridge Journey.



The Geographical Journal.

No. 6.

JUNE, 1897.

Vol. IX.

ANNIVERSARY ADDRESS. 1897.*

By the PRESIDENT.

On our anniversary this year we also celebrate, with feelings of loyalty and devotion, the sixtieth anniversary of the reign of our gracious sovereign and patron, Queen Victoria. We look back for sixty years, and find my respected predecessor, Mr. William R. Hamilton, and his Council offering their congratulations on the young Queen's accession. In their letter of July 8, 1837, they expressed their "heartfelt thanks for Her Majesty's gracious condescension and munificence in granting to us the honour of her royal patronage, and in bestowing upon the Society a royal premium for the encouragement of geographical science and discovery. They confidently anticipated that Her Majesty's reign would be famed for its glory and prosperity, and for the promotion of geographical knowledge."

With our Queen's reign commenced the series of Presidential addresses. The first was delivered by Mr. William R. Hamilton, whose honourable career ought not to be unfamiliar to the present generation of Fellows. Born in 1777, Mr. Hamilton entered the diplomatic service when very young, was secretary to Lord Elgin at Constantinople in 1799, and was employed on a special mission to Egypt in 1801. He rescued the trilingual stone of Damietta, and saved the Elgin marbles after the shipwreck off Cerigo. Mr. Hamilton was Under-Secretary of State for Foreign Affairs during a momentous period, from 1809 to 1822, and Minister at Naples from 1822 to 1825. He then gave himself up to the pursuits of literature and science, was a trustee of the British Museum, treasurer of the Royal Institution, a founder of the Hakluyt

* Delivered at the Anniversary Meeting of the Royal Geographical Society, May 17, 1897.

Society, President of the Dilettanti Club, twice President of this Society, and well known in London society for thirty years. The duty devolved upon Mr. Hamilton of congratulating our patron on her accession, and of delivering the first Presidential address, in which he reviewed the state of geographical knowledge in 1837, the year of Her Majesty's accession.

It cannot fail to be interesting to look back upon our position when the Queen came to the throne, as described by our President, Mr. Hamilton, and by our accomplished Secretary, Captain Washington, R.N. Of the Ordnance Survey of England, 75 sheets had been issued out of 120 of which the whole map was to be composed. In Scotland the primary triangles were unfinished. The Townland Survey of Ireland was making progress, and an admirable memoir of the county of Londonderry had been published, which was intended to be the first of a series. It might serve as a model for the descriptions of counties which have since been proposed by Dr. Mill. In India, 36 sheets of the 150 which were to complete the atlas had been published; the officers of the Indian Navy were actively engaged in surveying the coasts; Lieut. Wellsted had reported the details of his journey into the interior of Oman; and Sir Alexander Burnes was exploring the course of the Indus. As regards Persia, Mazanderan and Azerbajan had been described by Monteith and D'Arcy Todd, Taylor Thomson had ascended the peak of Demavend, but Sir Henry Rawlinson's invaluable memoirs had not yet been received. The expedition of Colonel Chesney on the Euphrates had just completed its labours, and that distinguished explorer was the first to receive the Royal Award after Her Majesty's accession.

The interiors of China and Japan, of Central Asia, Tibet, and Afghanistan, were practically unknown.

A glance at a map of Africa in 1837 is still more suggestive of the marvellous progress of geographical discovery during the Queen's reign. Our Secretary, Captain Washington, had written an exhaustive memoir on Morocco and the Atlas range. The Barbary States, Egypt to the second cataract, and part of Abyssinia were fairly well known. There were the discoveries of Mungo Park on the Niger, the routes of Denham and Clapperton, and the important discovery of the mouths of the Niger by Lander, which entirely altered preconceived ideas of a vast region. Mr. Boscroft had ascended the old Calabar river and the Quorra; and Mr. McGregor Laird had reported on the commerce and navigation of the great river, which was opened to trade in 1830 by Lander. Knowledge of South Africa was bounded by the Orange river until the very year of the Queen's accession; when Sir James Alexander returned from his journey of 1500 miles through the country of the Namaquas and Damaras. With these exceptions the map of Africa was a vast blank, with three black caterpillars crawling on it. One was marked "the Mountains of the Moon," another "the Keng Mountains," a third "the

Laputa Mountains," or "Spine of the World," with an imaginary lake Maravi by its side, indicated by a dotted line. Here, in unknown Africa, there was a vast field for the labours of our Society.

Australia presented another field for discovery. Captain Charles Sturt had completed the exploration of the great river system to the westward of the Blue mountains, by tracing the river Murray to its mouth, and naming it after Sir George Murray, the second President of this Society. In 1836 Sir Thomas Mitchell, following up the work of Sturt, had discovered the fine tract of country which he named "Australia Felix," now the colony of Victoria. The town of Melbourne was founded just before the Queen's accession. On the north-west coast the results of the expedition led by Lieuts. Grey and Lushington had not yet been received, and for the rest, the map of Australia, like that of Africa, presented a vast blank.

In North America, Deane and Simpson had connected Sir John Franklin's surveys with those of James Ross, and had thus accomplished the glorious task of determining the northern limits of the continent; but vast tracts of the Hudson's Bay Company's territory, of the western region claimed by the United States, and of a wider region still claimed by Mexico, were practically unknown. In South America, the Society was employing Sir Robert Schomburgk to explore the interior of British Guiana. He was engaged on this service, and was doing admirable work at the time of the Queen's accession, his expenses being mainly defrayed by our Council. Lieuts. Maw and Smyth, of the Royal Navy, had descended the Amazon, and Captains King and Fitz Roy, having completed their famous surveys of the Straits of Magellan and their western approaches, the latter was actively engaged on the western shores of Chile and Peru. Vast tracts and the courses of many navigable rivers in the interior of South America were still entirely unknown.

In the Pacific and Indian oceans many islands, including New Guinea, were unexplored and practically unknown. But under the guidance of Sir Francis Beaufort, who was a member of our Council for nearly a quarter of a century, marine surveyors were most actively employed, both at home and abroad. I have alluded to the work of King and Fitz Roy in the Straits of Magellan and on the west coast of South America. They formed a school of surveyors—Graves in the Mediterranean, Skyring on the east coast of Africa, and Wickham and Stokes in Australasia. The most severe work was on the African coast. Captain Owen changed his whole crew and officers twice, Bateler and Skyring falling victims to the climate. The crews of the *Etna* and *Raven* all but shared the same fate. Yet Captain Vidal completed his surveys of the Canary isles, and of the west coast of Africa to Benin. "This gigantic survey," says Washington, "embracing the east and west coasts of Africa from Suez, round the Cape of Good Hope,

to the Pillars of Hercules, may be said to have been drawn and coloured with drops of blood." In short, our gallant surveyors had delineated the coast-lines, but the interiors of the continents showed enormous unknown blank areas.

The Rosses had returned from Boothia, and Sir George Back from the discovery of the river which bears his name. Prince Regent's inlet and the Hecla and Fury strait were known, while Parry had previously laid down the southern coasts of the Parry islands. With these exceptions the vast arctic area, north of the American continent, was a blank. The antarctic region was an absolute blank, except where Captain Cook had reached the 70th and Captain Weddell the 74th parallel, on different meridians.

While Mr. Hamilton thus set forth the state of our knowledge of the earth's surface in the year of Her Majesty's accession, he also gave some account of the cartography of that period, then under the able lead of Arrowsmith and Walker, and of the literature of our science; while he spoke, with that enthusiasm which inspires the same feeling in others, of the career of an explorer. "Buoyed up," he said, "in his greatest difficulties by the consciousness that he is labouring for the good of his fellow-creatures, the explorer feels delight that he is upon ground hitherto untrodden by man, that every step he makes will serve to enlarge the sphere of human knowledge, and that he is laying up for himself a store of gratitude and of fame."

Animated by the patriotic zeal so eloquently described by my predecessor, and influenced in no small degree by the desire to win the Royal Award of our Society—that guerdon bestowed by their Sovereign—British geographers, facing perils and hardships of no ordinary kind, freely risking and often giving up their lives in the cause of science, have during sixty years heroically striven to fill up the great blanks which existed on the map of the world in the year of the Queen's accession.

The geographical history of the Queen's reign was opened by Sir James Ross's Antarctic Expedition, which left England in 1839. The initiation of this memorable voyage was due to Captain Washington, *R.N.*, our Secretary, whose suggestions were very warmly adopted by the British Association. The urgent necessity for a magnetic survey of the southern seas made it incumbent on the Government to despatch the expedition, independent of the important results to be derived from geographical discovery. James Ross had already endured eight arctic winters, and had passed sixteen navigable seasons in the polar regions, while he had acquired European fame as a magnetic observer. He was, without comparison, the fittest man for the command of the expedition, which crossed the antarctic circle on January 1, 1840. In one short month he made one of the greatest geographical discoveries of modern times, amid regions of perpetual ice, including a southern continent,

which was named Victoria Land, an active volcano 12,400 feet high, and the marvellous range of ice-cliffs. This may fairly be considered to have been the only real antarctic expedition, for Ross alone, until 1895, forced his way boldly into the polar pack, faced all its dangers, and penetrated far to the south after passing through it.

But since Sir James Ross returned in 1842, no one has been sent to continue his work. Of late years the necessity for an antarctic expedition has become more and more urgent; for many reasons, but chiefly because the science of terrestrial magnetism is at a standstill, owing to the absence of any observations in the far south during the last fifty years. The knowledge which would be acquired by such a magnetic survey will not only be of scientific interest, but will also be of practical importance to navigation. Deep-sea soundings, dredgings, temperatures of the ocean at various depths, meteorology, the distribution of marine organisms, are some of the investigations which would be undertaken by an antarctic expedition with reference to the ocean. Equally important objects would be to determine the extent of the south polar land, to ascertain the nature of its glaciation, to observe the character of the underlying rocks and their fossils, and to take meteorological observations on shore.

In November, 1893, it will be remembered that Dr. John Murray read an exhaustive and stirring paper to advocate the renewal of antarctic exploration, and that his views were endorsed by the highest scientific authorities in this country and on the continent. This Society then undertook the task of obtaining the despatch of an antarctic expedition, and I, as your President, promised that I would never swerve from that task until it was completed. I have since done my best. My communication to the Royal Society led to the preparation of a most valuable Report by a committee of that body, and to an unsuccessful application to the late Government. Our own Antarctic Committee met several times and drew up a report of a more practical character. I invited co-operation from the principal scientific bodies in this country and in Australasia, and addressed letters to the governments of the Australian colonies and of New Zealand. In December, 1894, I induced the Council of the British Association, when Lord Salisbury was in the chair, to pass a strong resolution in favour of the despatch of an expedition. In 1895 I read papers on the subject at the Imperial Institute and at the United Service Institution, which I have every reason to believe had a good effect. At the International Geographical Congress, a most important antarctic paper was read by Dr. Neumayer, of the Hamburg Zee-waarte, and a resolution was passed, urging the importance of a renewal of antarctic research in the interests of science.

Thus the subject had been well ventilated, and in the autumn of 1895 it was considered that the time was ripe for calling the attention of the First Lord of the Admiralty to the advisability and sound policy

of despatching another naval scientific expedition to the antarctic ocean. The answer, however, was unfavourable, so far as the despatch of a naval expedition was concerned. Yet there appeared to be every reason for anticipating favourable consideration for our advocacy of polar research. Mr. Goschen was himself the minister who had fitted out and despatched the *Challenger* expedition. He was, therefore, well acquainted both with the scientific advantages to be derived from such enterprises and with their public importance. But the usefulness of these expeditions to the navy is the point which we hoped would be most clear to naval administrators. The preparation for the defence of our country and our commerce must be the great object of naval operations in peace time. The building of ships is a work of such great importance that it cannot be exaggerated. But the supply of opportunities of distinction for officers and men is of still greater importance. Work requiring special care and coolness of judgment, work needing an accurate decision to be formed and acted upon on the instant, work presenting novel situations and suggesting new ideas,—all these kinds of work strengthen and form a sailor's character, widen his perceptions, and increase his self-reliance. All this is supplied by an antarctic expedition. An officer will not find exactly the same work in war service, but the work he has seen when employed on special service during peace time will have furnished him with many ideas and many experiences which cannot fail to increase his efficiency and his value.

Captain Mahan has eloquently borne witness to the fact that "good men with poor ships are better than poor men with good ships. Over and over again the French Revolution taught this lesson, which our own age, with its rage for the last new thing in material improvement, has largely dropped out of memory."

Captain Mahan spoke too truly. The great duty of seeking the means of giving our naval officers every possible opportunity of distinction in time of peace, on special service, is ignored. We have been told that officers cannot be spared from the ordinary routine of the fleet; that times are much changed from the days of the *Challenger's* commission, and are now much more unsettled. It is forgotten that the naval superiority of Great Britain, in the days of St. Vincent and Trafalgar, "lay not in the number of her ships, but in the wisdom, energy, and tenacity of her officers and seamen," and that these qualities are now to be acquired by such special service as is involved in an antarctic expedition. It is forgotten that in the good old times neither war nor the fear of war were any check to the despatch of naval expeditions of discovery. Captain Cook was sent on his third voyage at a time when France, Spain, Holland, and the American insurgents were all vainly banded together for our destruction. In the midst of the French revolutionary war, Captain Vancouver was calmly surveying the

intricate straits and sounds of New Albion, and Captain Flinders was exploring the shores of Australia.

Last November I addressed another letter to the First Lord of the Admiralty representing the necessity for organizing a private expedition if, as he had told me, it was decided that one under naval auspices could not be despatched, and urging that an undertaking of that character should at least receive substantial help, and have the good will and sympathy of Her Majesty's Government. In reply, I have been informed that the Lords Commissioners of the Admiralty regret that they are unable to take any direct part in the organizing of an antarctic expedition, although they regard the enterprise as one which is important in the interests of science. But their lordships will watch the results of a private expedition with great interest, and will be prepared not only to aid in the outfit by the loan of instruments, but also to place any experience which may have been gained in the past at the disposal of those chosen to conduct an expedition. For it must be borne in mind that hitherto, alike in the days of Cook as in the days of Ross, antarctic work has always been undertaken by the Government, and is strictly naval work.

Yet this important public service must now be undertaken by this Society, or be left undone. A great and serious responsibility thus devolves upon us. But I feel sure that the great body of the Fellows will concur with the Council in the decision that it is a duty which ought not to be shirked. We have not the means to undertake it without generous co-operation. We have, however, the sympathy and good will of the Admiralty; and we shall not, I firmly believe, appeal in vain to the patriotism and energy of private individuals in Great Britain, or to the governments in Australasia.

As the geographical history of the Queen's reign commenced with an antarctic exploration, so the sixtieth year from Her Majesty's accession should be worthily commemorated by preparations for continuing the exploration of that southern continent which bears the name of Victoria.

Turning from the south to the north polar region, we find that the work during the sixty years of the Queen's reign, which has been done by Englishmen, is of vast geographical importance. Very soon after the return of Sir James Ross, the ill-fated expedition of Sir John Franklin was despatched to attempt the long-sought passage from Ballin's bay to Bering strait, and, as is well known, the discovery was made when Graham Gore reached Simpson's cairn in the spring of 1847, but at a terrible cost. During the ensuing ten years the persistent efforts to rescue Sir John Franklin's gallant followers or to ascertain their fate led to the discovery and exploration of thousands of miles of previously unknown arctic coast-lines. Never, before or since, has difficult and perilous service been rendered from loftier motives, never

with greater enthusiasm and more single-minded zeal. The whole system of arctic travelling was organized with marvellous results. In this way the intricate and extensive archipelago north of the American continent was thoroughly explored by numerous sledge-parties. McClintock on one occasion, without the aid of dogs, travelled over 1228 miles in 105 days, in the spring of 1853; and Meham, in 1854, also without dogs, travelled 1336 miles in 60 days, at an average of 20 miles a day. These journeys have never been rivalled or approached in arctic travelling without the aid of dogs. After the return of McClintock, in 1859, there was an interval of neglect, but the Council of this Society never relaxed in its efforts to secure the renewal of arctic exploration, until these efforts were crowned with success. In 1875-76 the expedition of Sir George Nares was despatched, and with a gallant determination in the face of great and unexpected difficulties, which ensured success, its members performed the work desired by our Council. Three hundred miles of coast-line, with all the accompanying scientific results, were added to our knowledge. Since then Leigh Smith has corrected the map of Spitzbergen, and explored the southern coast of Franz Josef Land; while the Jackson expedition is still engaged on the exploration of the Franz Josef archipelago. This is the third arctic winter that has been faced by Mr. Jackson and his companions; and we confidently anticipate that they will return after having thoroughly explored that interesting group, and made an exhaustive examination of its fauna, flora, and geology.

Englishmen have discovered the whole of the American side of the arctic regions from Bering strait to the north coast of Greenland, and have explored the intricate system of channels and straits which separate the numerous islands. They have thus thrown open to the knowledge of the world, a vast amount of information in all branches of science, and have especially taken the largest share in preparing for the solution of the polar problem. Dr. Nansen, by his memorable drift of the *Fram*, has supplied what was needed to complete the means of comprehending what had previously been a mystery. For this great service to geography Nansen has received a special gold medal from this Society; and he has rendered over memorable, in arctic history, the sixtieth year of the Queen's reign. It saw the solution of the north polar problem.

The polar work of the last sixty years has been of surpassing interest and of immense importance. In other parts of the world, the ceaseless activity and zeal of her subjects has also rendered Her Majesty's reign a memorable epoch in the record of human progress. On the Asiatic continent, one generation after another of British surveyors and British explorers has pushed forward our knowledge until the work is now approaching completion. The Trigonometrical Survey of India is the grandest monument of the Queen's reign on the

Asiatic continent. When Her Majesty ascended the throne, Colonel Everest was in mid-career. The whole conception of the survey was the creation of his brain. Modifications and improvements have since been introduced, but nearly everything was originated by the great geodesist. Under his guidance his school of surveyors attained a degree of accuracy and perfection of skill which it would be impossible to surpass. The Meridional Arc Series is the perpetual record of his fame. Sir Andrew Waugh succeeded Everest, and his most memorable work was the North-east Himalayan Series, whence he measured seventy-nine lofty peaks, including Mount Everest, the highest in the world. From 1861 to 1883 General Walker completed the principal triangulation of India, having pushed forward the work with untiring zeal and ability, and published its history. The Great Trigonometrical Survey of India, consisting of ten measured bases and 3598 stations, thus completed, presents a record which forms one of the proudest pages in the history of English domination in the East.

While our own territories were mapped on the most rigorous scientific principles, our explorers have continued to penetrate from India into the remotest and least known parts of Asia throughout Her Majesty's reign. In the year of the coronation our gold medallist, Lieut. John Wood, *i.e.*, was exploring one of the passes of the Hindu Kush, and, first among English explorers, he reached the Pamirs, and discovered the lake at the headwaters of the Oxus, which received the name of Her Majesty. Ten years afterwards Dr. Thomson was the first to attain the summit of the Karakoram pass, and twenty years after that Hayward and Shaw traversed the snowy range at great altitudes and penetrated into Eastern Turkistan. Little time was lost in following up these discoveries, for practically, and from the point of view of a scientific geographer, they were discoveries. Colonel Henry Trotter and his companions, not only went beyond Kashgar into the Artysh district in one direction, and into the Pamirs as far as Wood's Victoria lake in another, but also connected the Russian with the English surveys; while St. John, in 1874, completed the six-sheet map of Persia. Since then the work has proceeded almost continuously in Persia, Central Asia, Tibet, and China. In the footsteps of the Buddhist pilgrims and of Marco Polo, journeys have been made from Peking to Kashmir by Carey and Younghusband, over Western Mongolia by Ney Elias, and from Kokand to China by Littledale; while the previously unknown northern plateau of Tibet has been traversed by Bowyer, Littledale, and Wellby. Nor must I forget to mention our Vice-president, Mr. George Curzon, whose most valuable memoir and map of the Pamirs has just been published by our Council, following on his map of Persia in 1892. The Chinese rivers have been explored by many travellers since Captain Blakiston received our gold medal for his ascent of the Yang-tze in 1862; and while such men as Colborne

Baber minutely examined the remote provinces of Yunan and Szechuen. Captain Gill made his very remarkable journey from Batang, on the borders of Tibet, to Bhamo, in British Burma. Much, however, remains to be done on the Asiatic continent, and it is encouraging to know that there are many volunteers, and that the geographical enthusiasm of young officers is as great as ever. We look back upon the Asiatic labours of the Queen's geographical subjects, during the last sixty years, with pride and admiration; while we know that the generous emulation it has excited in the minds of the young aspirants of the present generation ensures a vigorous continuation of the great work with the same devoted zeal, and with similar important results.

The continent of Africa was a vast blank on the map of the world in the year of the Queen's accession. Its subsequent exploration has been in great part due to the energy and liberality of this Society, of which Her Majesty is the patron. We therefore look back upon our work in that quarter of the globe with no ordinary satisfaction. The result of Dr. Beke's admirable geographical work in Abyssinia, in 1840, was to make known the true physical structure of those African highlands, and to show that the mountains of the eastern side of the continent formed a meridional chain. In another direction, Mr. Francis Galton made known the region of the Damaras and the Ovampo, while Dr. Baikie opened the navigation of the Niger. Then what may be called the Livingstone period of African discovery, extending over twenty years—from 1852 to 1872—began to throw additional lustre on the geographical history of the Queen's reign. Livingstone had already penetrated to the Zambezi, prepared himself at the Cape observatory for scientific observation, and attached the faithful Makololo tribe to his service, when he started from Luanda in May, 1854, on his memorable journey across Africa, down the course of the Zambezi. The wonderful falls of that river, more splendid even than Niagara, received from Livingstone the name of Victoria; and he reached Quilimane, after traversing the continent, in May, 1856.

On February 13, 1858, this Society celebrated its Livingstone festival, to wish Godspeed to the great explorer when he set out, with Sir John Kirk, on his second Zambezi expedition. He hoped to find, by that river, a pathway to highlands where Europeans might settle, and whence they might slowly but surely impart to the people the blessings of Christianity. Ascending the Shiré, Livingstone and Kirk discovered Lake Nyasa, and the highlands attaining a height of 8000 feet. The wishes of the discoverers were amply fulfilled in the subsequent history of Nyasa-land. Discovery led to more careful exploration. Missions followed, and the country, first made known by Livingstone and Kirk from 1859 to 1862, is now a flourishing colony with steamers on its rivers and lakes, an increasing trade in ivory and coffee, law and order fully established under the able administration of Sir Harry Johnston, and every prospect of increasing prosperity in the future.

The expeditions from the East Coast of Africa were more directly connected with this Society, aided by grants from Her Majesty's Government. It was under our immediate auspices, and mainly at our expense, that Burton and Speke, after overcoming extraordinary difficulties, discovered the shores of Lake Tanganyika. The admirable memoir on the results of his journey by Sir Richard Burton occupies the whole of one volume of our *Journal*. It was also under our auspices, and mainly at our expense, that Speke and Grant discovered the Victoria Nyanza, and thence traced the course of the Nile to Gondokoro.

The expeditions of Burton and Speke resulted in an enormous stride in our knowledge of African geography, though several great problems still remained to be solved. It was then that Sir Roderick Murchison proposed to Dr. Livingstone the work of defining the true watershed of Inner Central Africa. The veteran explorer undertook this difficult and perilous task, leaving England in August, 1865. After discovering the lakes of the Isaalaba, and the Manyema region, he was found by Mr. Stanley at Ujiji, at the end of his resources. But with fresh supplies he again turned away from home, resumed his arduous labours, and died alone, but in the midst of his discoveries, on May 4, 1873. The Society long occupied itself with schemes for the relief of Livingstone, and devoted its funds for this purpose without stint. We sent expeditions both to the West and the East Coast. Lovatt Cameron, originally sent by us to search for Livingstone, made a remarkable journey in the interests of geographical discovery after he had ascertained that, without doubt, the great explorer was no more. He was the first European traveller who walked across the African continent from east to west.

There has been no halt in the steady progress of African discovery since Burton and Speke set out from Zanzibar in 1857. Twenty years afterwards Stanley discovered the whole course of the Congo, and St. Vincent Flakine descended the Limpopo to its mouth. But these grand achievements only stimulated further research, our Society always taking the lead. For five years, from 1879 to 1884, our Council sent out expeditions entirely at its own expense. Our first enterprise, after the lamented death of Mr. Keith Johnston, was led by Mr. Joseph Thomson, who ascended the river Rufizi, reached the northern shore of Lake Nyasa, examined the Lukuga outlet of Tanganyika, and discovered Lake Leopold. Our second enterprise was also entrusted to Mr. Joseph Thomson, who was to explore the region round the lofty mountains of Kilimanjaro and Kenia. He was again completely successful, and his humane treatment of the natives, his inexhaustible patience with them, and cool enduring courage, were even more admirable qualities than his enthusiasm, energy, and scientific attainments. His proudest boast was that of the 150 men who landed with him at the mouth of the Rufizi he only lost one, and that he never once had to fire a gun against a native, for either offensive or defensive purposes.

Since the return of the Thomson expedition the work of African exploration has advanced with increased rapidity. Stanley's great expedition, in which he penetrated through forests from the Congo basin to the region of Nilotic lakes, and his discovery of Mount Ruwenzori gave it an extraordinary stimulus. From Stanley's return may be dated the commencement of more scientific exploration, combining accurate survey with trained observation in other branches of knowledge. Our Society took the lead in this change, by supplying the means of geographical instruction, and the best African explorers of the last fifteen years have fitted themselves for their work in the field by going through a course under our instructor. The value of the results has increased in proportion to the increased attainments of the workers; and the names of Selous, Gregory, Grenfell, Last, Loverson, Sharpe, Scott Elliot, Lugard, and Vandeleur, may be mentioned amongst the enthusiastic and accomplished men who are rendering illustrious the present generation of African travellers.

The sixty years of Her Majesty's reign has seen the great blank space, which represented the interior of Australia in 1837, covered by the tracks of intrepid explorers in all directions. Three years after Her Majesty's accession my old friend Count Strzelecki opened Gipps's land to our knowledge. In the same year Edward John Eyre, the pioneer of South Australian explorers, discovered Lake Torrens, and in 1841 he undertook the hazardous enterprise of traversing the waterless region between St. Vincent's gulf and King George's sound. It was a splendid piece of geographical work, achieved in the face of frightful sufferings and of obstacles which to most men would have been insurmountable. Mr. Eyre, our senior living gold medallist, still survives in the enjoyment of a green old age, and of the retrospect of a life well spent in excellent service to geography, and most distinguished service to his country.

But the whole story of Australian discovery is a long record of dangers and privations nobly faced, and of indomitable pluck and determination. We read, with wonder and admiration, of Sturt's dangers and hardships at Cooper's creek in 1845, of Leichhardt's journey to Port Essington; of the crossing of Australia from south to north by Burke and Wills, and of their falling martyrs to science at Cooper's creek in 1861; of the splendid journey by McDonnell Stuart, and of the overland journey of the young Jardines along the York peninsula. The expeditions of the brothers Gregory were on a large scale, and did much valuable scientific work; while the journeys of Colonel Warburton, of John Forrest and Ernest Giles, forced the forbidding deserts of Western Australia to yield up their secrets, and to come within the explored area of the Queen's dominions. It has been the privilege of our Society to make grants of money to further Australian work, especially to the Leichhardt Search Expedition, and we have conferred Her Majesty's award on ten Australian explorers.

Nor have the islands of the Malay Archipelago and of the Pacific been neglected during the Queen's reign. Rajah Brooke commenced work in Borneo, which has been ably continued by Mr. Hore and others connected with the North Borneo Company; Wallace and H. O. Forbes have, in their fascinating memoirs relating to the Malay Archipelago, given special attention to the geographical distribution of animals; Woodford has explored the Solomon islands; and Sir William MacGregor's labours in New Guinea, so perseveringly continued and so carefully and conscientiously performed in a most trying climate, are the admiration of his brother geographers.

In the dominion of Canada, a vast amount of exploration has been achieved since we awarded the gold medal to Captain Palliser in 1859, for his work in the Rocky mountains, especially by Dr. Dawson, and under his superintendence. M. Petitot has contributed largely to our knowledge of the northern lakes, Ogilvie to that of the Mackenzie and Yukon basins, Mr. A. P. Low to that of the interior of Labrador, and Dr. Bell and Mr. Tyrrell to that of North-East Canada. But South America has received less attention. The Queen's reign opened with Sir Robert Schomburgk's admirable geographical work, undertaken under the auspices of our Society, in British Guiana; and he has had some worthy successors in the same country, especially Mr. Everard im Thurn, who accomplished the ascent of Mount Roraima in 1884. In the basin of the Amazonian valley Mr. William Chandless won our Gold Medal for his survey of the Purus, one of the least known of the tributaries of the river Amazon, for a distance of 1866 miles, by which he considerably modified the maps of the interior of South America. But on the whole this continent has received less attention than other parts of the world, though its interest yields to no other; and there is now a wider and more fruitful field for the explorer in South America than in any other part of the world.

The science of oceanography, though founded by Major Rennell, has only risen to importance during the Queen's reign, having been made popular by Maury's charming 'Physical Geography of the Sea,' and having become practically useful through the necessity for examining the floor of the ocean in order to lay telegraphic cables. The laborious investigations of Dr. Carpenter in the *Porcupine* and *Lightning* led to the equipment of a very important expedition on board the *Challenger* in 1873, commanded by Sir George Nares, with an accomplished scientific staff under Sir Wyville Thompson. During her three years' commission the *Challenger's* researches were extended over the Atlantic, Pacific, and Indian oceans, and even beyond the antarctic circle. The expedition added largely to our knowledge of the physical geography of the sea; and the publications of its results in fifty volumes, under the editorship of Dr. John Murray, is a monument of valuable and exhaustive research. The examination of

the bed of the ocean, and the investigation of its temperatures, are a branch of physical geography which has been developed during the Queen's reign, and is now a recognized part of our science, of the greatest practical importance and of the deepest interest.

The retrospect of our labours during the reign of Her Majesty cannot fail to give rise to reflections on the very important duties which this Society has to perform. It has been seen that the discoveries of the last sixty years have always been warmly supported and encouraged by our Council, and that the most important enterprises were initiated and maintained by our funds and under our guidance. To take only one example and its results from the region of eastern tropical Africa, Lakes Tanganyika and Victoria Nyanza, and an immense area of important country previously unknown, were discovered and afterwards fully explored entirely through the initiative and mainly by means of the funds of the Royal Geographical Society. The result has been, not only that numerous facts of deep interest have been added to the sum of human knowledge in all branches of science from this region alone, but also that our labours have formed a firm and solid foundation for an enlightened phase of imperial policy, and for measures with a view to the establishment of trade routes and colonies, the beneficial effects of which will be felt in the distant future.

When we contemplate these immediate consequences of our geographical work, it will, I am sure, be felt by all who are connected with this great Society, that it occupies a position of national importance, a position which entails most serious duties and heavy responsibilities. It is our privilege to render frequent services to several departments of the Queen's Government; to take the lead in numerous enterprises, many of which are eventually recognized, in their results, as involving considerable benefits to the nation; and to prepare the means, by our great collections of books and maps, and by the facilities we can give for instruction, for others, including the authorities under Imperial guidance, to follow in our footsteps.

It has been these considerations which have led to the system of instruction for our discoverers and explorers which has now been so satisfactorily and efficiently established by our Council. I am glad to be able to announce that a measure has been adopted which I have been advocating at intervals during the last twenty years. A diploma is to be granted to those pupils of Mr. Coles who have gone through a complete course of instruction, and whose sufficiency is certified to by a committee consisting of the instructor and two members of our Council. A statement of the course of instruction in practical astronomy and surveying, given under the direction of the Council, has been printed and sent for information to the War Office, Colonial Office, and India Office. These diplomas will, I feel sure, be highly valued by those who receive them, especially by officers in the civil or military employment

of Her Majesty's Government, the demand for instruction will increase, and the efficiency of the discoverers and explorers of the future will be enhanced tenfold.

For it must be remembered that much remains to be discovered and explored in all parts of the world. I am desirous of having statements drawn up, and placed in the hands of the Secretary for the use of inquirers, explaining what geographical work remains to be done on each continent. Mr. Noy Elias has drawn up such a memoir for Asia; Mr. Ravenstein has undertaken to prepare one for Africa; and, assisted by Colonel Church, I have myself written one for South America.

The measures for promoting the study of geography throughout the country, which have been adopted from time to time by the Council, have not been without satisfactory results. Undoubtedly they have, at least, had the effect of securing the attention of those who are engaged in the profession of education, and of enforcing the necessity of adopting improved methods. They have led to the establishment of a permanent geographical readership at the University of Oxford, as I was able to announce last year. The Council has now resolved to give a large measure of support, out of the Society's funds, to a London School of Geography, if such an institution should be successfully established under Mr. Mackinder's auspices. Our plans have been altered, as we acquired experience, but our aim has always been the same—to train good geographical teachers, and to promote the teaching of geography on a sound basis in our secondary schools and universities.

The record of the last sixty years has been one of arduous effort, of rapid progress in some directions, of steady progress in all, and it has been a record of unvarying success. Our numbers have increased from less than 600 in 1837 to 3845 in 1897. Our income has increased from £1300 in 1837 to £11,000 in 1897, and our expenditure from £1262 in 1837 to £10,820 in 1897. Our power of disseminating geographical knowledge, and promoting geographical discovery and exploration, has, of course, increased in proportion. Thus we could only spend £400 on our *Journal* and its illustrations in 1837; now we spend £3415. The cost of our evening meetings in 1837 was £9; now, including refreshments, lantern slides, hand-maps, reporting and printing, it is £542. These figures tell their own story. During Her Majesty's long and glorious reign, the Royal Geographical Society has developed from a small and struggling, though deserving and promising, institution, to a great and powerful body, with numerous important duties; with powers which, when well directed, as I believe they almost always have been, are of value to the nation; and with corresponding responsibilities.

In loyally commemorating this sixtieth anniversary, we look back over the period that has elapsed, since our President of 1837 addressed his letter of congratulation to Her Majesty on her accession, and of thanks

for the interest the young Queen had shown in our Society, by her patronage and her bounty. Through all that long period of resolute endeavour to advance the cause of geography, this Society has loyally striven to deserve the high honour of having the Sovereign for our patron, and of being entrusted with the very responsible duty of annually conferring her royal awards. But the approval of Her Majesty, when her subjects have distinguished themselves by performing arduous and valuable geographical work, has not been confined to the bestowal of awards through our Council. On more than twenty occasions the Queen has been graciously pleased to confer special honours on those explorers and geographers who have also received the awards of this Society. The desire to win these distinctions, and to obtain this gracious approval, has always been a strong incitement to those gallant and intrepid geographical heroes who, with thoughts full of loyalty to their Queen, have rendered her reign glorious by filling in the great blanks which spread over Asia, Africa, Australia, and the arctic regions in 1837, when Her Majesty ascended the throne.

In offering, therefore, our respectful and loyal congratulations on the completion of the sixtieth year of a glorious reign, the President, Council, and Fellows of this Society do so with the conviction that our marvellous advances in all that relates to the progress of our science are due, in no small degree, to the tokens of approval bounteously accorded, and to the fervent feelings of affectionate loyalty inspired by our most gracious sovereign and patron, Her Majesty Queen Victoria.

FOURTH CENTENARY OF THE VOYAGE OF JOHN CABOT. 1497.*

By the PRESIDENT.

THE discovery of North America by Englishmen, led by a Genoese pilot, under the direct authority of Henry VII., is an important event, second only to the discovery of the West Indian islands by Spaniards, led by another and a greater Genoese pilot, whose fourth centenary we celebrated five years ago. But, unfortunately, the records of the two voyages have not met with equally careful treatment. The memory of Christopher Columbus was venerated. His letters and his journal were preserved, and his life was written by an affectionate and truth-respecting son; so we know not only all the details of his life-work, but the man himself, with his virtues and his faults. It has fared very differently with John Cabot. Not a single scrap of his own writing has been preserved. The few meagre details that have come down to us are at second-hand and sometimes contradictory, and an

* Paper read at the Royal Geographical Society, April 12, 1897. Map p. 692.

undutiful son ignored the achievements of the great explorer and tried, only too successfully, to appropriate his renown. Hence we can only grope in the dark, among doubtful materials, and form an outline of the most probable course of events during the Cabotian voyages.

These voyages are, however, not so important as those of Columbus, because they were not a turning-point in the maritime history of the country which sent them forth, and because they did not immediately lead to colonization. Indeed, there was an interval of 110 years between the discovery of North America and the founding of the first permanent colony in Virginia.

There was great activity in English seaports, increasing commercial enterprise, and even voyages of discovery, long before the ventures of John Cabot, which were merely episodes in the history of the maritime progress of our country. Bristol took the lead in the fifteenth century; but Southampton, London, and some eastern ports were not very far behind, and voyages were made to the Mediterranean, to the Baltic, and even to Iceland.

William Canynge, the leading Bristol merchant in the reigns of Henry VI. and Edward IV., is recorded to have had ten large trading ships, which made voyages to the ports of the Teutonic Knights, to Halgoland, Finmark, and Iceland; and the spirit of enterprise, and even of discovery, was then abroad. Canynge lost a vessel of 160 tons on the Iceland coast, and in 1477 Columbus himself learnt from English sailors of Bristol the management of an ocean voyage, when he visited Ultima Thule. The spirit of maritime discovery was developing rapidly in England, and William Wyreestre, a Bristol man, tells us of one important undertaking, but doubtless there were many others that were unrecorded. On July 15, 1480, a vessel of eighty tons sailed from Bristol under the command of Captain Thyldes, the most scientific seaman in all England at that time. His object was the discovery of land to the west of Ireland called "Brasylls," and he seems to have made a very gallant attempt, battling for two months against the Atlantic storms, and not returning until September 18. Thyldes was the English father of exploring enterprise. Once aroused, it was not allowed, by the Bristol merchants and seamen, to slacken; for it is stated by the Spanish ambassador that, from 1491 to 1498,* they sent out two or three vessels every year in search of the land reported to exist to the westward of Ireland.

It is clear, then, that not only trading voyages were habitually made by English sailors over stormy seas out of sight of land, but that numerous voyages of discovery were despatched while the Portuguese

* "It is seven years since those of Bristol used to send out, every year, a fleet of two, three, or four caravels to go and seek for the Isle of Imaul and the seven cities according to the fancy of this Genoese" (Ayala).

were still cautiously creeping along the African coast, and long before Cabot appeared on the scene.

John Cabot was probably a Genoese, but he was domiciled at Venice from 1461 to 1476, married there, and became a Venetian citizen. He is then said to have visited Mecca; he went to Spain and Portugal, where he heard of the plans of Columbus for sailing westward to Cathay; and he appears to have been an experienced pilot and cartographer. He came to England, with his wife and three sons, at some time before the year 1496, but not long before, for he was probably in Spain at the time when the projects of Columbus were under discussion.*

On March 5, 1496, Henry VII. granted Letters Patent to John Cabot and his three sons, Lewis, Sebastian, and Sanctus, to fit out ships under the English flag, and to discover new isles and mainlands. His sons were all born at Venice, probably while their father was domiciled there to qualify for citizenship. Having obtained these important privileges from the king, John Cabot went to Bristol, the city whose seamen were inured to the navigation of stormy seas and accustomed to voyages of discovery. He had licence to take five ships, but, after more than a year of preparation, he only fitted out one small vessel, called the *Matthew*, according to Barrett,† with a crew of eighteen men. They were all Bristol sailors, except one Burgundian, and a barber from Castiglione, near Genoa. Soncino says that Cabot granted islands to these two adventurers. Joannes Ruysch, the Hollander (or German) who drew the very remarkable map in the Ptolemy of 1508, is said, by his commentator, Marcus Benaventanus, to have sailed from England to the coast of America. He may have been with Cabot, or in one or other of the two or three voyages sent from Bristol after 1498. The names (seven in number) on the "Terra Nova" in his map are, however, all Portuguese. The plan of Cabot was the same as that of Columbus, to sail westward until he reached the ports of Cathay and Cipango.

There is no account of the voyage at first hand, but a few details are given in three Italian news letters, written in London after the return of Cabot, two by Raimondo di Soncino to the Duke of Milan, and one by Lorenzo Pasqualigo to his brothers. There is also a statement in one

* Ayala, "He has been in Seville, and in Lisbon, procuring to find those who would help him in this enterprise." This must have been before he came to England, and after such an enterprise had been suggested to his mind by the success of Columbus. It has been conjectured that the visit of Cabot to Spain and Portugal took place between his first and second voyages. I think that the evidence is against this supposition. Pasqualigo speaks of him as living with his family at Bristol in the end of August. Soncino, writing in December, speaks of having conversed with him in the autumn, of his having constructed a globe, and makes no mention of his having been abroad. His new letters patent were granted in February. There was no time, amidst all his preparations, for a visit to Spain and Portugal, and no inducement to undertake it.

† "History of Bristol" (1780), but Barrett does not give a reference to the document from which he quotes.

of the legends, on a map drawn by Sebastian Cabot in 1544. As the explorer returned early in August, and was absent about three months, he must have sailed on one of the first days of May.

The *Matthew*, then, set out from Bristol, on her memorable voyage, on May 2, 1497. Soncino, writing on December 18, 1497, reported that John Cabot passed Ireland, then shaped a northerly course, and finally navigated to the eastern (meaning western) part, leaving the north star on the right hand, and having wandered thus for a long time, at length he hit upon land,* where he hoisted the royal standard and took possession. Soncino had actually conversed with Cabot. Pasqualigo says that the distance was 700 leagues, which is about correct; that Cabot coasted along the land for 300 leagues and landed,† but saw no inhabitants; and that, in returning, he saw two islands to the right. Soncino mentions the enormous quantities of fish near the new land.

The legend on the map of Sebastian Cabot, drawn in 1544, further states that the land was sighted in the morning of June 24, St. John's day, and that the name of St. John was given to an island because it was discovered on the same day. On the map a large island, called S. Juan, is placed to the west of Cape Breton, in the position of the Magdalen group. The map shows Newfoundland as a detached group of small islands. The legend mentions the dress and weapons of the natives, gives a list of fish and birds, and asserts that there are many white bears and large stags like horses.

This exhausts the material for learning the history of the discovery of North America by Englishmen under the lead of John Cabot. There are the news letters of Soncino and Pasqualigo, written at the time; and the legends; and map of Sebastian Cabot, drawn up half a century afterwards. Soncino further reported that Cabot had drawn his discoveries both on a chart and on a solid sphere which he constructed; and the ambassador, Pedro de Ayala, mentions, in his despatch of July 25, 1498, that the chart had been sent to Spain.‡ It

* "He has discovered two very large and fertile islands" (Soncino). "He set out from Bristol, a port in the western part of this kingdom. Having passed Ibernica, which is still further to the west, and then shaped a northerly course, he began to navigate to the eastern part, leaving (during several days) the north star on the right hand; and having wandered thus far for a long time, he hit upon land" (Soncino).

† "He says he has discovered, 700 leagues off, the mainland of the country of the Great Can, and that he coasted along it for 300 leagues, and landed, but did not see any person" (Pasqualigo).

‡ The legends on the map, according to Mr. Harrisse, were written by a Dr. Grajales, who received his information from Sebastian himself at Seville.

§ "As I believe your highnesses now have intelligence of all, as well as the chart or mappemonde that this Genoese has made, I do not send it now, though I have it here" (Ayala, July 25, 1498).

"He has the description of the world on a chart, and also on a solid sphere which he has constructed, and on which he shows where he has been; and proceeding towards the east, he has passed as far as the country of the Tamils" (Soncino, December 18, 1497).

appears on the famous map of Juan de la Cosa (1500) as a coast-line running east and west, with flags showing its limits.

We will now, with the help of these meagre details, consider the position of the probable landfall of John Cabot. It will be seen, from the observations I am about to make, that some of my views have been modified since the publication of my introduction to the Cabot documents in the volume issued by the Hakluyt Society in 1893. Soncino was told that after passing Ireland he went north. As he intended to go to the west, it may be assumed that he was forced northwards by stress of weather, and that he resumed his westerly course as soon as possible. We may take it that he turned his ship's head west, in about the parallel of Blacksod bay, and held that course across the Atlantic. After passing the meridian of the Azores, there would be westerly variation, as Mr. S. E. Dawson was, I think, the first to point out, and magnetic west would really be W. by S. $\frac{1}{2}$ S. The landfall of the *Matthew* would, under these circumstances, be Cape Bonavista, on the east coast of Newfoundland. Columbus also steered a westerly course, except for two days when he shaped a W.N.W. course, and for the last three days when he steered W.S.W. These two deviations from west about balance each other. The same amount of southing, caused by the variation of the compass, which took Columbus to Guanabani, would have taken Cabot to Bonavista bay. Taking Soncino's account of the voyage by itself, there can be no question that Bonavista bay, on the east coast of Newfoundland, was the landfall. The statement of Pasqualigo, that Cabot afterwards coasted along the land, is probable enough, though there was little time for a coasting voyage, and the exact distance of 300 leagues is a rough, and no doubt an exaggerated, estimate.

But there are the statements in the legend and on the map of 1544 by Sebastian Cabot. Mr. Harrisse rejects them altogether, on the ground of Sebastian's habitual mendacity. For those who are not inclined to go so far, there is nothing actually impossible in his statement that the landfall was at Cape Breton. Although a west course by compass would have taken the *Matthew* to Bonavista, she might possibly have been drifted, by wind and current, so as to clear Cape Race, though such a drift is very unlikely at that time of year. It is just possible that she might have passed Cape Race in thick weather without seeing it, and reached the point on Cape Breton island marked on the map of 1544 as "Prima Tierra Vista." Sebastian places a large island, called San Juan, to the westward, in the position of the Magdalena group.* The assertion of Sebastian Cabot that there were plenty of white bears on Cape Breton island, and his ignorance of

* This cannot possibly be Sentiari island, as suggested by Mr. S. E. Dawson; for the San Juan island of Sebastian's map is to the west of the land.

the coast-line of Newfoundland, as shown by its delineation as a group of small islands, show that his statements are inaccurate and careless versions of what he had heard, and that he was not himself on board the *Mathew*.

The chart of John Cabot was, as we know from the ambassador's despatch, sent to Spain in 1497 or 1498, and was incorporated in the great map drawn by the pilot Juan de la Cosa, between April and October, 1500. There we find a continuous coast-line running east and west, without any regard to proportionate distance, which is excessively exaggerated. It must, however, represent the results of the first voyage of John Cabot, and cannot refer to the second, because the map had been sent to Spain before July, 1498. There are five flags, one at each extremity of the land, and three between them. Twenty-two names are given—one to a sea, three to islands, ten to bays, one to a river, and eight to capes; five being those of saints. This coast-line, copied from the chart of John Cabot, and running east and west, though so enormously lengthened out by Juan de la Cosa with reference to the European part of his map, appears to be intended to represent Cabot's delineation of the south coast of Newfoundland, plotted as the explorer sailed along it from Cape Race to Cape Breton, or from Cape Breton to Cape Race. The first point to the east, called "*Cabo de Ynglaterra*," would then be Cape Race. The large "*Isla de la Trinidad*" is Burin peninsula. A cape "*de lisarto*" is probably named from a fancied resemblance to the Lizard in Cornwall. "*C. de S. Jorge*" is Cape Ray, the most westerly point called "*Cabo descubierto*" is Cape Breton, and the deep bay between them indicates the channel between Cape Breton island and Newfoundland. I take this opportunity of mentioning that, at the suggestion of Admiral Wharton, made about ten years ago, this strait between Cape Breton island and Newfoundland received the name of Cabot strait, a name which has been generally accepted.

The saints after whom places are named on this coast-line are St. Gregory, St. Nicholas, St. Lucia, St. George, and St. John. Old discoverers generally gave the name of the saint on whose day it was first seen, to a cape or bay, and the days of St. Lucia and St. Nicholas were in December, that of St. George in April, while Cabot was sailing along the coast in July. But this rule was not invariable, for names of saints were also given to places because vows had been made to them, or because they were patrons of the discoverer, or of his relations or friends. The names were much corrupted in transcription and conversion into Spanish equivalents by Juan de la Cosa, and the coast-line drawn by Cabot was transferred to the Spanish map without much regard to scale or latitude. As Juan de la Cosa places Cuba and the Antilles well to the north of the Tropic of Cancer, such carelessness need cause no surprise. The coast-line seems to

indicate that the *Matthew* sailed along the south coast of Newfoundland.*

The two islands called S. Grigor and I. Verde, placed to the east of the Cabo de Ynglaterra (C. Race) on the map, may have been misplaced in transcription, and should be off the south coast, where they would represent the two islands seen on the right hand when Cabot was returning—the present islands of Miquelon and St. Pierre. These may have been the islands said by Sencino to have been granted by Cabot to his barber and to his Burgundian shipmate.

The first voyage of John Cabot is the first successful voyage of discovery which sailed from an English port. For those who can place credence in the statements of his son Sebastian, he passed Cape Race in thick weather, and made a landfall at Cape Breton on June 24. For those who reject the evidence of the map of 1544 and its legend, John Cabot made a landfall at or near Bonavista bay, not necessarily on June 24; then coasted along the south coast of Newfoundland until he was in sight of Cape Breton, returning nearer the land, so as to pass the islands of St. Pierre and Miquelon on his right hand. This coasting voyage would cover several hundred miles altogether, but not quite 300 leagues, as Pasqualigo has it; for we must take the coast-line shown on the map of Juan de la Cosa, running east and west, as a copy of the coast-line on Cabot's chart along which he sailed, being apparently the south coast of Newfoundland.

Much confusion has been caused, both by early writers and by their modern commentators, owing to the events of the two voyages of Cabot being confused together. The news letters of Pasqualigo and Sencino refer to the first voyage: the statements of Sebastian reported by Ramusio and Peter Martyr refer to the second voyage.

John Cabot received a grant of £10 for discovering "the new Ile" on August 10, 1497, and a pension of £20 a year was granted later, the first payment being made some time after Easter, 1498. Meanwhile he lived at Bristol, with his Venetian wife and his sons.† On February 3, 1498, fresh Letters Patent were granted to him by

* The twenty-two names on the coast-line discovered by the English, on the map of Juan de la Cosa, are—

1. Mar descubierta por Ingleses
(30l flag) (4th flag)
2. Cabo descubierta.
3. C. de S. Jorge.
4. lago foch.
5. andro (2nd flag).
6. C. luchi.
7. S. Lucia.
8. Requilla.
9. los quoi.
10. de Haarle.
11. Menista.

12. Argare.
13. forte.
14. ro lungo.
15. Isla de la Trinidad (2nd flag).
16. Cabo de S. Juan.
17. S. Nicolas.
18. Agrou.
19. C. Sastanatre.
20. Cabo de Ynglaterra (1st flag).
21. S. Greger.
22. I. Verde.

† Pasqualigo.

Henry VII., to take six ships for the further discovery of the new isles. Cabot still hoped, by sailing westward, to reach Cipango. The second expedition was also fitted out at Bristol. One ship was commanded by Lancelot Thirkill, of London, and he received a royal loan of £30 for its equipment. He returned safely, for he is mentioned as having repaid the loan on June 6, 1501. Thomas Thirkill also received a loan of £30. Thomas Bradley received a similar loan, and probably commanded another vessel. A third vessel may have been commanded by John Carter, who received a loan of £40 5s. All these are mentioned as "going to the newe ile." The expedition consisted of five vessels, with crews numbering three hundred men, and they sailed in the spring of 1498. Nothing more is heard of John Cabot. His fate and the date of his death are unknown, and there is not a scrap of his writing preserved.

The Spanish ambassador, Dr. Puebla, reported, in July, 1498, that the expedition had sailed, that it was provisioned for a year, and that it was expected to return in September. Don Pedro de Ayala added that one of the vessels had been forced to return to Ireland by stress of weather, with a friar named Buil* on board.

Sebastian Cabot, while he was in Spain as chief pilot, spoke of his father's second voyage as if he had not only commanded it, but fitted it out at his own expense. He told a gentleman, who related what he had heard from Sebastian at the house of Hieronimus Fracastor † (when Ramusio was present), that his father died at the time when the news came that Columbus had discovered the Indies, that the king fitted out two vessels for him in 1496, and that he discovered the land from 36° N. to Florida. He told Ramusio that he had been to 67° 30' N. He told Peter Martyr that he furnished two ships in England at his own charges, and that he discovered the land from the sea full of ice to the latitude of the "Promtum Herculeum." Gomara and Galvano, who give similar accounts, appear to have copied from Peter Martyr and Ramusio. Sebastian Cabot, in making these statements for his own glorification, never mentioned his father except to say that he was dead before the voyages were made, and that he, Sebastian, fitted out and commanded the

* It has been suggested that this "friar named Buil" was identical with the Fray Bernande Buyl or Buyl, who was appointed by the Pope to go to the Indies with Columbus in his second voyage. There is not a shadow of grounds for the supposition beyond a fancied resemblance in the name. Fray Bernande returned to Spain in 1495, but he was far too important an ecclesiastic to have wandered away to England and embarked in one of Cabot's ships. He belonged to the monastery of Monserrat, and the name is Catalan. *Buil*, in Ayala's letter, is no doubt a Spanish corruption of some English name.

† "My father died at the time when the news came that the Genoese Christopher Columbus had discovered the coast of the Indies. . . . I made my thought known to the king, who was well content, and fitted out two caravels for me with everything needful. This was in 1496, in the commencement of the summer. I reached the height of 36° under the pole."

expeditions. He did not stick to the same tale, telling the guest of Fracastor that the king fitted out two ships for him, and making Peter Martyr believe that he equipped them at his own expense.

Yet these are the only accounts, loaded as they are with falsehoods, which have come down to us respecting the second voyage of John Cabot. The probable modicum of truth is that the great navigator, or the English captain who commanded after his death, went north along the coast of Labrador until his progress was checked by ice, and then south as far as Cape Hatteras. We know that one of his captains, Lancelot Thirkill, returned home safely. We also know that the consort of Gaspar Corte Real returned to Lisbon in October, 1501, from the North American coast, with a piece of a broken sword gilded, which was certainly made in Italy, and reporting that two silver rings of Venetian workmanship were seen in the possession of a native boy.* These must have been left by Cabot's people in 1498.

It is very doubtful whether Sebastian Cabot accompanied his father on either of his voyages. In 1521 the Livery Companies of London were required by the king to fit out five ships for a maritime expedition under the command of Sebastian. The companies remonstrated, the Warden of the Drapers being their spokesman. He said that Sebastian Cabot was not born within the realm of England, and that he was never in the new found land himself, "though he makes report of many things he had heard his father and other men speak of in times past." The warden would not have dared to say this if Sebastian Cabot, who was then in England, could have disproved it. The contemplated expedition never sailed. There is not a particle of evidence that Sebastian did go with his father, except his own statement on the map of 1544, that the new land was discovered by John Cabot and Sebastian Cabot his son. His own stories told to the guest of Fracastor and to Peter Martyr were that he commanded the expeditions, which we know to be false. It is not improbable that he or one of his brothers would have accompanied their father, but, in the absence of any evidence that he did, I think that the statement of the Warden of the Drapers must be accepted as true.† Yet for centuries Sebastian Cabot has robbed his father of his fame as a great discoverer, and has been lauded to the skies as an Englishman born in Bristol who discovered North America, and was the founder of our maritime greatness. The diligent research of Mr. Harriess and others has now exposed this imposture. Sebastian Cabot was born at Venice, probably while his father was domiciled there to

* Pietro Pasqualigo to his brothers, from Lisbon, October 19, 1501.

† "And we thynk it wote to sore a venture to Joperd v shippes with men and goods unto the said land upon the singular trust of one man callyd, as we understand, Sebastyan, which Sebastyan, as we here say, was never in that land hym self, all if he make reporte of many things as he hath hard his father and other men speke in tymes past" (Report of the Wardens of the Mercers and Drapers, March 11, 1521).

qualify for citizenship,* and it is doubtful whether he even accompanied his father on his voyages across the Atlantic.

John Cabot was the first to lead Englishmen across the Atlantic, and his voyage must therefore be ever memorable. But he was not the originator of English voyages of discovery. A very gallant voyage of discovery was led by Thylde, a scientific English sailor, sixteen years before, which was followed by several similar voyages. English sailors had long been accustomed to sail across stormy northern seas to Iceland and Norway, and in search of the western land. But their knowledge of navigation was not equal to that of the seafaring peoples of the Mediterranean shores, or of the Portuguese at that time. They were apt scholars, and in a very short time they surpassed their masters; but in 1497 the British seamen crossed the Atlantic for the first time, under the guidance of a Genoese pilot, whose great achievement will be commemorated this year, the four hundredth since his discovery, in the dominion of Canada and in Newfoundland, as well as in England. We can only form a judgment of the character of John Cabot by the light of the very few facts that are recorded. He was a scientific seaman and a good cartographer, energetic, brave, and persevering, for these qualities were necessary for the accomplishment of the enterprise he undertook. He must also have combined his practical abilities with imagination and some enthusiasm. A foreigner, and at first unknown, he must have possessed the faculty of winning the confidence of his men, and of gathering round him the most able and daring seamen of the time. John Cabot probably died early during the progress of the second expedition, as he is not heard of after the ships left Bristol. The credit of completing that most important voyage, which gave to England the whole eastern coast of North America by right of discovery, therefore belongs to the English captains, probably led by Lancelot Thirkill, who certainly brought his ship back to England.

The discovery of North America by English seamen under the lead of John Cabot was followed up by voyages in 1501 and 1502, for which Letters Patent were granted to Richard Ward, Thomas Ashurst, John Thomas, and Hugh Elliott of Bristol. Other voyages followed; there was then an interval of comparative neglect, but Henry VIII. sent two expeditions to America, and in the time of Queen Elizabeth the merchants of the western ports of England employed a fleet of small vessels on the Newfoundland fishery. This trade became the great

* Mr. Harrison has made researches and inquiries which lead him to the conclusion that letters patent were never granted to minors. In that case, Sebastian was certainly born while his father was domiciled at Venice to qualify for citizenship. Under any circumstances, his own earlier statements, and all the probabilities, show that he was born at Venice, and cannot be counterbalanced by the single statement of Eden that Sebastian told him he was born at Bristol. Sebastian's habitual mendacity deprives any such statement, if Eden reported it correctly, of any weight. The Warden of the Drapers reported that Sebastian was not born within the realm of England.

nursery of seamen for our navy, and Sir Walter Raleigh said, "The Newfoundland fishery is the mainstay and support of the western counties. If any accident should happen to the Newfoundland fleet, it would be the greatest misfortune that could befall England."

At length, through the patriotic enterprise of Sir Walter Raleigh, aided by the indefatigable labours of Richard Hakluyt, a colony was planted in Virginia, followed by others, until the complete foundations were laid for the rise of the great republic of the United States. The first link in this long chain of events was forged by John Cabot when he led British seamen across the Atlantic in 1497. The dominion of Canada, Newfoundland, as well as the United States of North America, all the people of English origin on the western continent, must look on John Cabot as their Columbus. It is well, therefore, that we should commemorate the fourth centenary of his voyage, and that we should join with our brothers across the Atlantic in doing honour to the memory of the great Genoese pilot, who was the first to lead English seamen over the wide ocean to the western continent.

It is, however, necessary, if any good purpose is to be gained by it, that all should be united with regard to the nature of the celebration. It looks as if unanimity cannot be obtained on the question of the landfall. Labrador must be rejected as out of the question. Those who reject the evidence of the map and legend of 1544 properly maintain that Bonavista bay was the landfall; while those whose faith in Sebastian Cabot is unshaken, will continue to believe in the Cape Breton theory. All the facts that are ever likely to be known are before us, but men will continue to regard them from different points of view. If unanimity is to be obtained—and it seems most desirable that there should be unanimity in the celebration of so momentous an event—the landfall should not be its pivot. The Royal Society of Canada, in celebrating the voyage of John Cabot, has, therefore, wisely determined to avoid debatable ground, and simply to pay a tribute to the great navigator, by placing a brass tablet in the Legislative Hall at Halifax, Nova Scotia, where advocates of every view can meet on common ground. The tablet, which will be inaugurated at Halifax next June, will have the following inscription:—

"This tablet is in honour of the famous
Italian Navigator, JOHN CABOT,

who, under the authority of letters patent of Henry VII., directing him to conquer, occupy, and possess for England any lands he might find in whatever part of the world they be, sailed in a Bristol ship, the *Mothuen*, and first planted the flags of England and Venice, in the June of 1497, on the north-eastern seaboard of North America, and by his discoveries in this and the following year, gave to England a claim upon the continent, which the colonizing spirit of her sons made good in later years.

"This tablet was placed in this hall by the Royal Society of Canada, in the June of 1897, when the British Empire was celebrating the sixtieth anniversary of the accession of Her Majesty Queen Victoria, during whose

beneficent reign the Dominion of Canada has extended from the shores first seen by Cabot and English sailors, four hundred years before, to the far Pacific coast."

The Newfoundland Cabot Committee has decided to improve the signal-station at St. John's, and to erect an observatory there. Another suggestion, that any permanent memorial of the fourth centenary of the first voyage of Cabot should have Cape Race for its locality, also seems to have much to recommend it. It is between the two landfalls. It must have been a prominent object in the voyage. It is the "Cape of England," named by Cabot himself if, as seems probable, the coast-line and names of Juan de la Cosa were copied from Cabot's map. On Cape Race might stand the memorial, the "Cabot Lighthouse," an improvement or adaptation of the present one, lighting the great navigator's successors, on their way across the Atlantic, for ever.

After the reading of the paper, the following discussion took place:—

Mr. G. R. F. Prowse: The paper so fully covered and impartially described all that we know about Cabot that we naturally turn to the one debated point, his landfall. It was suggested by a fellow-colonist of mine that there should be a meeting in St. John's of the debating societies there, and that the question of landfall should be discussed and settled once for all. Well, I hardly think even this learned Society will dare to take that course! I would like to first mention another closely connected subject, *viz.* was Newfoundland and the north-east coast of America known before Cabot went there, or did he know of it when he sailed? Dr. Winsor considers it very probable that whalers were on this coast before 1497, and also the Cantino map, so perfect that it could hardly have been completed between 1497 and 1502. Other writers believe that the inhabitants of the Azores were on the banks of Newfoundland before Cabot. Mr. Beasley points out that the Azores were the dowry of the Duchess of Burgundy, and it seems to me that this Burgundian who went on the voyage with Cabot was probably an Azorean, employed, not because of any prior knowledge of Newfoundland, but simply for his nautical skill. I don't hold Dr. Winsor's view; there are physical reasons against it. I consider, and others have considered, that the field ice in the spring and the polar ice later separated the new world from the old quite as effectually as the Sahara separated the north from the rest of Africa. I also consider that the Cantino map can be reconstructed synthetically from other maps. I think, when we examine the accounts of the voyage, there is an undercurrent of disappointment at its results. Certainly the Bristol seamen were going out again to fish, but Cabot was not satisfied with that, and I think there would hardly have been such public rejoicing at the finding of the "new" land if it had been known before.

As regards the landfall, the President has mentioned the most likely one, Bonavista, but it is not impossible that Cape Breton could have been reached. Labrador does not need much discussion; it has been pointed out by Dr. Dawson that the fish do not reach northern Labrador during the time that Cabot could have been there. We have, therefore, only the two traditional landfalls, Cape Breton and Bonavista, to consider. The legends on the Cabot map do not to my mind agree with the known facts. For instance, at the side of the map the land is described as sterile; that is not what Cabot found. Now, as regards Bonavista, there is a tradition in Newfoundland that it was the landfall. It is supported by a map (Mason's) in 1617, also by a map in Paris by Du Pont, on which (if it does

not refer to Bonavista, it can refer only to Newfoundland) *prima inventa* is written in red ink very close to Bonavista. Inside Bonavista bay exists to-day a place called King's cove, which is evidently where an English standard was set up; there is also a little cove called Keels, where the ship first struck the ground—this clearly cannot be of Portuguese origin. Castileon is possibly the old name of the place now known as Castle bay, and I think it may refer to the island given to Castiglione, Cabot's barber. There is also, on one of the early maps, an isle of St. Zachary, a Venetian saint, and there was a river Jordan, and still is to-day a Moses island—whether Newfoundland is like the promised land, I won't say! it is certainly England's oldest colony, and I hope some day may be a prosperous country. I have examined every map in Paris and London to see if I could discover anything more definite, and the results are disappointing. I think I can trace nearly all the other voyages, the second voyage of Cabot, and the first and second of Corte Real, and the Breton voyage in 1504, but there is no direct evidence of the first voyage of Cabot.

Before sitting down, I cannot avoid disagreeing with the President in his view of the Cosa map. To my mind it is, though made in 1500, a comparatively late type of map representing a voyage rapidly made in 1499 along the south coast of Newfoundland (which terminates at the third flag)—along, in fact, a coast already delineated (cf. the Oliveriana map), and then what I take to be the real object or result of that voyage commences to be shown on the Cosa map, namely, the circumnavigation of the gulf of St. Lawrence. I think those who compare this map with the map of Gaspar Viegas and that in the Ricardo library, will see the coast-line of the gulf is exactly the same in the three maps. In the Cosa, then, we have a map showing the western coast-line of Newfoundland for the first time, a coast-line conspicuously absent in the Cantino, Sevillean, and other early groups. I take it that this map, which shows more coast, cannot be a copy of Cabot's first chart. My own opinion is that Bonavista and the coast north of it was the part seen on Cabot's first voyage, but I would not, however, like to put it stronger than that that is the least unlikely part of North American discovery.

Colonel G. E. CUTCHER: The main object of our President, in giving us a paper on the first voyage of John Cabot to America, has probably been to invite debate, with the hope that, from the mist and mystery which surround that voyage, some truth may be evolved.

It is stated that Cabot's ship sailed May 3, 1497; that she made a landfall in the New World, June 24. She must have arrived home again about August 5; for on August 10, 1497, we find the king giving Cabot a reward of £10 for his discoveries. Continents were cheap in those days! If these dates be correct, it may be doubted if Cabot made the voyage attributed to him. His ship was small—a crew of eighteen men. His voyage out and back lasted but ninety-four to ninety-five days.

At that period the best speed of an Icelandic or a Norwegian ship was held to be 120 miles "for a day and night," sailing before the wind. In 1492, the ships of Columbus made the voyage across the Atlantic, from Gomara Island to Guanahani Island, in thirty-three days, a distance of 32°, measured on the arc of a great circle. This gave an average daily speed of 94½ geographical miles. The route offers one of the most beautiful voyages of the world—smooth seas, fair trade winds, and favourable currents. It is not conceivable that Cabot was equally favoured in his transit of the stormy, moody north Atlantic, or that he could have averaged over 60 to 70 miles daily. But let me accept the latter figure. Pasqualigo says that the outward voyage was 700 leagues. What was a Venetian league? I have made some effort to ascertain, but the result is unsatisfactory. There is evidence that there were 72½ to a degree; but, going into

details, I cannot make over 16, which is probably correct. Moreover, measurements were then based on fours and their multiples. Adopting 16, the 700 leagues become 2625 geographical miles. The distance, direct, from Bristol to the coast of Labrador is $31^{\circ} 30' = 1890$ miles.

The following estimate is of interest:—

700 Venetian leagues	2625 miles.
Return voyage	2625 "
Total	5250 "
At 70 miles daily	75 days.
Exploring 300 leagues of coast (during daylight) = 1125 geographical miles, at the rapid rate of 30 miles per day	37½ "
Hunting, fishing, provisioning, and repairing ship	30 "
Total	142½ "

as against the ninety-four days allotted to him.

Had he sailed out and home with all the favourable circumstances which attended the voyage of Columbus—94½ miles per day—his total days' absence would have been 123.

If we abandon Pasqualigo and his 700 leagues, eliminate the possible route *via* Iceland, and make the voyage direct, from Bristol to Labrador or to Bonavista bay, we have, out and home—

3780 miles at 70 miles daily	54 days.
Exploring 300 leagues of coast	37½ "
Provisions and repairs	30 "
Total	121½ "

against the ninety-four allotted.

If June 24 be accepted as the day Cabot made the landfall, the calculation runs even worse—

Exploring 300 leagues of coast	37½ days.
Provisions and repairs	30 "
Return home direct, 1890 miles, at 70 per day	27 "
Total	94½ "

against the forty-two days which remained to him up to August 5, 1497.

Permit me to suggest that the length of Cabot's voyage was *one year and three months*, not the apparently impracticable period of time which has been assigned to it, and that he sailed in 1496, and returned in August, 1497.

My friend, Mr. E. J. Payne, and myself, have, at the Public Record Office, examined the roll containing the original record of the patent granted to John Cabot and his sons, authorizing them to make the voyage which we have under discussion this evening. It is dated March 5, 11 Henry VII.—that is, 1496. The eleventh year of Henry's reign was from August 22, 1495, to August 21, 1496. The membranes forming the roll are not stitched together in the sequence of their dates, and the patent referred to does not show the year on its face, which raises a doubt as to its being the 11 Henry VII.; but, fortunately, we inspected the back of the membrane containing it, and, on the upper margin, found, clearly written, in the same hand as the body of the instrument, "*Rege Henrico, Septimo, undecimo XI. XI.*;" the several times repeated year making it irrefutable that the patent bears date 1496.

We also examined the petition of Cabot, which is of equal date with the Patent, and the terms substantially the same, both having probably been agreed upon before they were formulated. It was easy for a merchant of the wealth and position

of Cabot to enlist any support he may have solicited to fit out a ship which he himself was to command. His eager wish to solve the riddle of the West had impelled him to successfully spur the bold sailors of Bristol to fit out several expeditions for this purpose during his residence there. But now the great Cabot was to sail in person. Everything must have urged him to prompt action. The voyage of Columbus had set maritime Europe ablaze with the desire to seize any advantage which might arise from the rediscovery that the Earth was round. Was it probable that Henry VII. would, under such exciting circumstances, allow Cabot fourteen months to organize his expedition of only a single little craft, and thus leave England behind in the race for commercial power? Was Cabot the man to risk everything by delay, and let the prize fall into Spanish hands? Two months would be ample to fit out his ship. It is not difficult to believe that he set sail in early spring—perhaps May 3, 1496, and that his route to America was *via* Iceland. Bristol then had a large trade with that island in breadstuffs, beer, and liquors, which were exchanged for fish. The merchant, Cabot, might find it profitable to take a cargo *en route* to America, and lay in fish as provision for his crew. Moreover, the literature of Iceland teemed with accounts of voyages to Greenland, and thence south-west, since the days of Eric, Blarne, Lief, and his brother Thorwald; and as late as 1347, the records showed a voyage made to America by a small ship, with a crew of seventeen men, as if it were a common occurrence. Information of enormous value for Cabot's purposes awaited him in Iceland, and nowhere else to the same extent. Columbus went to Iceland for the same information, making a special voyage for the purpose. Why should Cabot neglect to avail himself of it when the island lay almost in his track? The main object of the expeditions of those days was to reach Cathay and Zipango by sailing west. Nobody then dreamed that an immense continent intervened. The map of Antonio Zeno, year 1400, showed Greenland to connect with Europe, and between Greenland and Labrador a vast strait extending north-west. It was the standard map of the north Atlantic during the fifteenth century. Cabot, as a renowned cartographer, must have been familiar with it. He would reach that strait, navigate it, and give to England the commerce of Oriental Asia. This, I believe, was the primary object of his voyage.

Soncinò says, "Passato l'Ibernia più occidentale e poi alzaratosi verso el septentrione, cominciò ad navigare ale parte orientale, lassandosi (fra qualche gloria) la tramontana ad manò drita," which I translate: "Having passed to the west of Ireland and running to the northward, he commenced to navigate towards Oriental parts (for several days), the north on his right hand."

I agree with Mr. Payne that *Oriental parts* means Eastern Asia.

The distance from Bristol to the coast of Labrador is, *via* Iceland, 40°, or 2400 geographical miles, or 640 Venetian leagues, by great circle sailing; but, allowing for deviations in sailing, it would be about the 700 leagues which, it is stated, Cabot sailed on his outward voyage. We have seen that the direct distance is but 31° 30', or 504 Venetian leagues, and that it makes but little difference to my argument whether the voyage was direct or *via* Iceland.

I am pleased to note that Mr. Payne, in his splendid 'History of the New World,' also believes that Cabot sailed from Bristol in 1496, but thinks that he wintered in Iceland. As to the latter, I am not disposed to agree with him; for I do not think that Cabot would have spent all the summer of 1496 and the succeeding winter there, when the object of his voyage, by so doing, might have been defeated. I believe that he collected his desired information, and proceeded as rapidly as possible, reached the coast of Newfoundland or Labrador late in June of 1496; then, true to his purpose of reaching "Oriental parts," sailed north-west.

up Davis strait until stopped by cold and ice, then turned south and examined the coast of America, at least as far as Cape Hatteras, just as Juan de la Cosa indicates on his map, published in 1500, as being the country explored first by *los Englesez*. The two islands which Cabot saw on his right, as he returned home, were probably Martha's Vineyard and Nantucket, both of which I know well. They lie to the south of Cape Cod, and perfectly represent the description of Soncino as being "fruitful, temperate lands." The island further west, and called "Isla de la Trinidad" by Cosa, is, I take it, Long Island, 120 miles in length.

Here I cannot neglect to quote Sebastian Cabot's statement to the "Mantua gentleman," "In 1496, in the beginning of July, I sailed towards the north-west . . . found that the land ran northwards . . . coasted to the 50th degree, but, seeing the coast turned towards the east, I sailed southwards as far as Florida" (see Harrison). Was Sebastian always "mendacious"?

Pasqualigo says that Cabot was "three months on his voyage," and "returned in August, 1497." Perhaps here lies the source of what I believe to be the error of four centuries. Very likely the return took three months. Is this what he meant?

If we limit Cabot's expedition to a short summer visit to lands which had been well known to the northmen for nearly five hundred years, it becomes commonplace; but, if my arguments be examined and found tenable, his voyage swells in proportions and dignity, and may well be classed as a great national achievement.

MR. E. J. PAXNE: The one thing which appears to be certain, in connection with Cabot's voyage, has been vividly brought before us in the President's admirable paper—the fact that it was made, not by Sebastian Cabot, as Sebastian alleged, and as is commonly supposed, but by his father, John Cabot, who obtained a charter in March, 1496, sailed to some part of America, described as the "New Isle," and returned in August, 1497. Although the details of the voyage were freely talked about at the time, no precise record of them appears to have been kept, and his exact course and landfall are to a great extent matters of conjecture. The view usually taken is that the whole voyage only occupied three months; and, if this were so, Cabot must have taken a direct course to Newfoundland soon after passing Ireland, in the manner which the President has described. Now, this view is founded on a single scrap of evidence; when Cabot came back he "said that he had been three months on his voyage." This is much more likely to have been meant to apply to his return voyage only than to the whole voyage. The antecedent probability is in favour of his having sailed in 1496; and Colonel Clurke has shown, I think, very clearly that he could not possibly have done what he is said to have done in three months. I do, for my own part, firmly believe that he availed himself of the knowledge of the Western continent which was current in Iceland, in consequence of the voyages of the old Northmen, and through Iceland current in Bristol, and that he reached America by way of Iceland and Greenland.

We know that for years and years before Cabot's voyage seamen had sailed every year from Bristol, for the island of the Seven Cities, and we know that they all failed. We have John Cabot setting out from the same place in 1496-97, and coming upon the New Land in the western ocean. According to the ordinary view, he was simply more persevering than his predecessors. I cannot help thinking that, on the contrary, he took a totally different course, and that his voyage was, in truth, a Northman's voyage. We know as a fact that he started northward, and after a time he turned to the west, making, as Soncino's letter in my opinion very correctly states, for the "eastern parts." Although Cabot's course was westward, it was directed towards the "eastern parts" of Asia, like all other voyages of the same class; and the shores for which he was making are therefore correctly described as the eastern parts. He reached America after making a course estimated at 700

leagues. Colonel Church has measured this on the globe, and finds that it corresponds with the route by Iceland and Greenland, bringing him by Cape Farewell to the coast of Labrador. In addition to this, we have the explicit statement made by Gomara in his '*Historia de las Indias*.' Gomara says, in so many words, that Cabot took "the route of Iceland" ("*la vuelta de Islandia*"). There is another thing which should not be forgotten. The land discovered by Cabot became forthwith known in England by the very name given to it in Icelandic tradition, the "New Land" (*Nýjaland*), or New Found Land; and this name has been applied to it ever since. The knowledge of the New Land which had been reached by the Northmen centuries before was not confined to Iceland; it had long been widely popularized in Europe generally through a geographical tract written by the German priest, Adam of Bremen, in the eleventh century, in which it is treated as a matter of common knowledge. We ought not to forget that Frobisher, who some years afterwards called for the "eastern parts," followed this northern route. He went by way of the Færoes, Greenland, and Labrador; this seems to be evidence of a current impression that the "eastern parts" would be most directly reached, as indeed they are, by a somewhat northward course rather than by one due westward. Whatever view we may take of the matter—and it must always be a matter of controversy—we shall all cordially agree that great light has been thrown upon it by the President's admirable address.

The **PRESIDENT**: Colonel Church pleads very strenuously for time, as the geologists used to do in former days, and it is quite possible that geographers may be obliged to concede it to him. It is a new theory to me, and I think probably to most people in this room, that Cabot passed a year and a half instead of three months on the voyage, and that he went round by Iceland. Of course it must remain a mere matter of conjecture, for the figures and facts of Pasqualigo can never be looked upon as more than gossip of a news-writer. So that the difficulty in which we are placed in regard to this very puzzling voyage is that we have no facts which are really sufficiently established to found a solid argument upon. It must be remembered that Sir Martin Frobisher's voyage took place nearly a hundred years afterwards; the whole of that coast had been explored when he was seeking the north-west passage, while Cabot was seeking a south-west passage. However, at this late hour of the evening it is impossible to go much into detail, and I think it only remains for me to propose a very hearty vote of thanks to those gentlemen who have so kindly joined in this discussion, which has been extremely interesting.

Colonel Church: I think we ought to propose a vote of thanks to our President for giving us the opportunity to have this debate.

FURTHER NOTES ON THE TRIPOLI HILL RANGE.*

By H. S. COWPER.

PART I.

A Ride from Tripoli to Khoms and Wadi Targelat, through the Districts of Tahrana, Jafara, and M'aulata.

THE short journey I took this year through the Tripoli hills, had, like that of the previous spring, as its chief object the investigation of the remarkable megalithic sites which are so numerous in this part of the Barbary coast; and as, under the present régime, excavations are out of

* Map, p. 602.

the question and travel difficult, I devoted my energies to trying to ascertain rather the geographical limits of the series than to making careful studies at any individual sites. I accordingly left Tripoli on March 2, with a small party of four Arabs, and my baggage on donkeys, and for the first two days I pursued a route coinciding with the previous year; so that on the second evening we camped on the outer slopes of the Tarhuna hills, some miles east of Fum Doga, and opposite the Fum Terrgurt, or mouth of the wadi of that name, which is the next important valley running through the hills.

The following morning was devoted to visiting some sites just outside



SEMAM SEMANA (TERRGURT).

the "fum," lying on a part of the slopes of a district called Jeabin, which extends from here south-east, and forms part of the Jafara country, which reaches to the sea. I should mention that one of these sites, called Semana, was the most remarkable of the whole series examined, for there had been originally no less than eighteen or twenty megalithic trilithons in a line, each with its massive altar placed before it. My guide not inappropriately remarked, "This must be the Medina (the capital)."

A few miles up the Wadi Terrgurt I was compelled to desist from the examination of another remarkable site in consequence of the threatening character of the local Arabs. It appeared that within and close to the walls of this ruin were the shrines of several merabuts, or saints; so that my appearance with note-book and measuring-tape collected a party of tribesmen, who were soon worked up into a

condition of ungovernable fury. In this dilemma my guide decamped with my camera, without my being enabled to take a single photograph. Fortunately, I had time for a few notes and measurements before this occurred.

The Wadi Terrgurt, like the adjacent valley of Doga, forms one of the principal routes into the Tarrhuna hills. Near its "fum," or outlet, it runs between clay cliffs, but higher up these are exchanged for rocky slopes. At some 8 or 10 miles from the "fum" it is joined by a tributary watercourse, the Wadi Guman, running from the south-west. A little way above the junction of these two wadis a prominent landmark is the hill called Ras el Guman, a bold isolated eminence dividing the two.



WADI TERRGURT ON THE PLAIN (LOOKING NORTH).

On the fourth day my route left the Wadi Terrgurt, and led me up Wadi Guman, over the backbone of the Tarrhuna hills on to the plateau. The road over this pass proved extremely rough and difficult, and before we reached the summit, which was about 1400 feet above sea-level, we had been compelled to halt six or seven times in order to replace the baggage, which was being continually torn from the backs of the donkeys by the projecting rocks. At last, after passing a bubbling streamlet, pouring from a small wadi on the right, near which we observed the remains of Roman dams, we saw in front of us the rolling plain on which I had camped the previous year. Before us was the dip through which the upper course of the Wadi Targelat meandered, and away to the right the tiny sanctuary called Sheikh el Madeni.

The following day, after some not very profitable diggings round the

altar of a Sonam here, I turned south-east to the districts named Ghirrah and Mamurah, through which runs the great Wadi Targelat, the upper course of the Cinyra of classic days. These districts, which lie south of the Ferjana plain described in my former paper, form a series of wide valleys undulating and green in character, and running towards the sea at Kam. These valleys, which have no deep ravines in them, are all branches of the Targelat, but go by the names of the districts they traverse. Thus we have Targelat mta Ghirrah el Kebir, and Targelat mta Ghirrah el Saghir, and also Wadi Bu Samida, apparently a branch course. Below to the south-east we come to Targelat mta Mamurah. Hereabouts, although the pasturage is fairly good, population seemed thin and tents few, though lower down, where it approaches the sea, it



WADI GURAN (LOOKING NORTH).

is said to be rather thickly inhabited. Here I had a great disappointment, for my guide refused to accompany me further than Mamurah, whereas I wished to proceed by the wadi direct to Kam; the population, he said, was thick, and here too had a reputation to venture through without a Government escort. As during both my excursions in the hills the behaviour of this man had given me thorough confidence in his knowledge of the country, I could not well disregard this advice, so that reluctantly I was compelled to abandon the idea.

On March 7, therefore, I turned back to the Ferjana plain, where we found numerous sites not visited the previous year, and soon were in sight of the small ruin which caps the summit of Jabel Meid at the

boundary of Tarhuna and M'salata. The peculiar desolate aspect of these uplands about Ferjana is very striking, for, while there is hardly a tent to be seen, and barely any cultivation, the eye is struck by the strange ruined megaliths dotted over the plain, almost wherever one looks.

An hour before noon we reached Senam el Nej'm, and thence I followed the route taken before, through Wadi Daun and the Kseia, until I reached Jebel Maid. We passed over the southern shoulder of this hill, and thence descended into the wide and beautiful valley of Ueni in the Kaimakamlik of M'salata.

Jebel Maid forms the last spur of the hill range to the east, and the traveller who makes his way to the coast at Khoms, or Tabia (Kam), gets a total change of country as he proceeds. The barren, treeless hills, with the dried-up watercourses and scattered tents of the tribesmen, give way, first to the broad Wadi Ueni, which, though containing no fixed villages and but a few scattered olive groves, possesses somehow a softer outline and less dreary aspect than the hills themselves. East from here is reached a tract of undulating country, on which is built a string of villages, one of which is called Kusabat, or the "Castles," but which, all combined, are known as M'salata, the capital of the district, and the residence of the Kaimakam. Crossing these slopes, we see everywhere that we are returning to civilization, or rather to settled life. Olive groves become more numerous, and amidst them nestle little houses of masonry. Lines of camels with their awkward loads of halfa converge by the various routes, which, winding from the different parts of the hills, join hereabouts and journey to the little port of Khoms, the centre of the trade on this part of the coast. Among the groups of Arabs we pass, it is not difficult to discern townsmen of M'salata or Khoms, whose less ragged costume and paler faces easily distinguish them from the wild tent-living Arabs only seen in the hills.

At four hours' ride from Khoms we suddenly arrived at a ridge, from which a wide panorama of coast and sea presented itself. From this point, some 500 feet above the sea, we looked over the most sterile and barren slopes imaginable, and I found it difficult to believe that I was gazing over the country which at one time formed the environs of the rich and flourishing city of Leptis Magna. From here the chief points in the landscape were a cape to the north of Khoms, and the Mergub hill with its ruined arch and castlet (probably a watch-tower and semaphore station of the Romans); but Khoms itself and the actual site of Leptis were invisible in consequence of intervening slopes. Away to the south-east could be traced the low coast-line about the mouth of the Targelat and Zliten.

From here to Khoms the country is thickly sprinkled with Roman ruins, which bear witness to the widespread influence of Roman Leptis; while numerous Senam sites, though mostly ill-preserved, show that the

builders of the megaliths occupied the country down to the coast. As we rode towards Khoms our attention was arrested by a noise of firing at some tents, followed soon after by the departure of a considerable party of Arabs, some mounted and some on foot. This proved to be an organized expedition against a gang of thieves who had attacked or plundered these tents, and the gun-firing was a signal to summon the tribesmen.

Brief as my ride had been, I was enabled to visit or note a large



SENAM EL-KHAB (M'ALANTA).

number of megalithic sites. In the Wadi Terrgurt they proved to be almost as numerous as in the adjacent Wadi Doga, while in the upper part of Wadi Targelat they cluster thickly. My guide stated that south of this they were less common, and that at no great distance they ceased to exist, but for this I cannot personally vouch. Those which were noticed in the vicinity of Khoms appear in most cases to have been altered or destroyed in Roman or Greek times; but it is a significant and curious fact that a Senam jamb remains *in situ* at a point which was probably included within the walls of ancient Leptis.

With regard to the geography of this country generally, it may be worth while calling attention to the paucity of any reliable information to be obtained from any modern maps. It may, indeed, be said that up to 1826 no map (if we except that of Dr. Barth) has ever been published which could be in any way useful to a traveller in this interesting little tract of country. Those which exist show a few places here and there, the positions of which were noted by Admiral Smyth and one or two others, but no attempt has ever yet been made to lay down correctly, or, for that matter, incorrectly, the physical features of the country. On Barth's map three or four wadis are shown, but the positions are by no means dependable, as, for example, the Wadi Terrgurt, which is shown running from Jebel Msid (M'salata), instead of from a few miles east of Wadi Dega. The War Office map of Tripoli is quite useless for this country, for in it even the place-names on the coast are in most cases, where I have been able to check them, incorrect or blundered in about three cases out of four.

At the little town of Khoms I remained about a week, partly in order to visit and make some examination of the adjacent ruins at Lebda (the ancient Leptis Magna), and partly to get an opportunity to visit Tabia, at Kam. Khoms is a tiny seaport of modern growth, owing practically its origin and present existence to the halfa or esparto export trade. The name Khoms is, properly speaking, a district one, but since its rise it has been generally applied by Europeans to the town; and since its existence is so largely due to European industry, it is perhaps only fair it should retain it. The Arabs, however, still usually call it Legatch, which is the name of the little headland close by, still retained on our Admiralty charts. European trade has adopted the spelling Homs, which is anything but satisfactory, as the Arabic initial is the guttural *Kh*, and the local pronunciation *Khummus*.

Tiny as the place is, it stands in marked contrast to the ancient capital of the Pashalik. Although in its rear lie the usual squalid Arab huts, the chief features of the town are the one or two wide streets, in which are the residences of the representatives of the halfa industries, the Turkish officials, and the telegraph company. The large barracks, the lighthouse, and the halfa yards all help to add a feeling of life and industry, which is hardly to be felt in the crowded alleys of the capital. One may almost venture to predict that, with its strong bracing air, its glorious climate, and the close proximity in which it stands to the historic ruins at Lebda, the little town of Khoms may some day (though perhaps a somewhat distant one) take a place among the minor Mediterranean health resorts.

The Clayya country at Kam is dealt with in another part of this paper, and has also been visited and described in more or less detail by various writers. From Khoms it is about three and a half hours' ride, so that the mouth of the river lies about 12 miles distant from the ruins

at Lebda. The road passes most of the way through the Sahel, a plain covered with palm trees; and at about two-thirds of the distance the little village of Suk el Khamis is passed, where, as the name betokens, a regular Friday market is held. Twenty-five minutes beyond this there is a sanctuary called Merabut Ali es Seah.

A mile and a half or two miles before reaching the mouth of the Targelat, a headland juts into the sea, which, on the Admiralty charts and War Office map, is named Ras el Tabia. Locally, however, it is known as Ras Magro, and on it there are the tombs of two saints, one Magro, who, strangely enough, is said to have been a Christian, and the other, Si Hamed el Magrebi. Just beyond lies a huge funduk, or warehouse, built originally by a Maltese as a depot for halfa grass, in the hope of opening up that trade at this point on the coast. From its proximity to Khoms and Zliten, the venture proved a failure, and when I visited the place I found it crowded with Greek sponge-fishers engaged in repairing their nets and sails. These men generally work at Tripoli, and it is only recently that they have made a trial at Tabia; and I learned that they had done well, in spite of losing several of their vessels. They were a picturesque and striking, although dirty, group; but, though Europeans, they had a far more rascally and thievish appearance than the white-robed Arabs we saw here, who, however, bear such a bad reputation.

This funduk is called Tabia by Europeans, but often by the local people the Marsa, or harbour. On our Admiralty charts, it appears (in an inset) under the name of Marsa Ugra, which seems quite unknown at the place, and is probably a blunder out of Marsa and Ras el Magro.

My return to Tripoli was made in an open halfa lighter with two Tunisian sailors—a method of travel, when with a good wind, more expeditious than luxurious. The sailors who manago these boats are always Arabs or Maltese, and thoroughly know their work, though they hug the coast all the way, ready to run ashore if the wind changes. In such a case the trip may be indefinitely prolonged; but if, as in my case, a fine favourable wind can be taken advantage of, it is soon over, and I effected the journey of 70 miles by night in 12½ hours—not bad travelling for a cargo lighter. For the traveller who wishes to visit Lebda and Khoms, and cannot wait for an esparto steamer, this is the best method to come from Tripoli; there is but little danger, except of the wind dropping; neither is there any degree of comfort, for the boats leak and are bailed all night. But the method is expeditious, and should be adopted in default of a better.

As we raced into Tripoli, I saw a cloud of dust lying over the Pianura, while the smoke of long Arab guns floated away to the sea. Ramadan was at an end, and 500 Arabs from the hills were celebrating its termination by the sport of Lah el Barud, or powder play.

PART II.

1. *The Physical Geography of the Hill Range.*

The hill chain of Tripoli may be said to commence on the east with the boundary between Tarhuna and M'salata, because between here to Leptis it falls away with gentle slopes. At this point we are about 15 miles from the sea, and from here the chain runs south-west to Nallut, where the distance from the coast appears about 90 miles. The intermediate portions are Gharian, Yefrin (the Beni Tefren of John Leo) and Nefusa; and as this last part is always known as "el Jebel," it is probably more truly mountainous in character than Gharian and Tarhuna.

The eastern portions of this range being those in which my own investigations took place, it may be of advantage to consider them a little in detail; and as the ancient sites I visited were only noted in any number between Wadi Wif on the west and Lebda on the east, the district we have to deal with is only small—some 60 miles in length; while from north to south, from the Jeabin district to Ghirrah in the Wadi Targelat, it measures only about 20 miles.

The physical characteristics of this region are sufficiently peculiar to merit notice. In the first place, the hill range is separated on the north from the sea by a district of gently undulating slopes, averaging, it would appear, some 8 or 9 miles in width, between which and the sea lies a sandy and inhospitable waste, which dies out to the east towards Khoms and Lebda. These slopes, inhabited by tribal semi-nomadic Arabs, like the hills themselves, are from 400 to 600 feet above sea-level.

The traveller approaching the true hill range from the north, whether at Tarhuna or Gharian, cannot fail to be struck by certain peculiarities. The hills are all nearly of the same level, so that the geographer finds it necessary to inquire the names of the various depressions which mark the outlets, or "fums," of the various wadis, where they emerge from the hills on to the slopes. So marked is the wall-like contour of the range, that we cannot resist the inference that at one time the sea covered both the desert strip and the slopes, and washed the base of these hills themselves.

Eastwards, however, this is less marked, for the country shelves off gradually from Jebel Msid to the sea at Khoms, and there are neither the cliff-like hills nor the desert patch.

On entering the range by one of the various wadis, the traveller will find a greater diversity of contour than he has been led to expect; for the hills, for some 10 miles from their northern boundaries, rise to a backbone from 1300 feet to 1600 feet above the sea. This is the crest or watershed of Tarhuna, and can be followed from Jebel Msid on the east along the hills at the heads of Wadis Doga and Guman to Jebel

Bu Tawil, whence it appears to run to Jebel Khashm Aruf, a bold bluff which is plainly discernible from the house-tops at Tripoli, to which it is the nearest point in the hill range.

2. *The Wadis.*

Rising at the crest and running to the sea are a series of valleys, which, though now dry most of the year, are all the same valleys of erosion. They form the highways or tracks by which the tribesmen always approach or leave the hills for the coast. They vary in width, but are similar in character, and between Wadi el Haira, due south of Tripoli and Khoms, there appear to be about fourteen principal ones. These are, enumerating from el Haira on the west—



WADI TERRGURT IN THE HILLS.

(1) W. el Haira; (2) W. Iamar, which joins the (3) Wadi Mejenin on the plain; (4) W. Libetr, which must be somewhere near, if not identical with, W. Melgha of our maps; (5) W. Serri; (6) W. Raml; (7) W. Saghia; (8) W. Doga; (9) W. Dughun; (10) W. Terrgurt; (11) W. Karathie; (12) W. Msid; (13) W. Bin Jabara; (14) W. Gerim.

Of these, my own travels led me into parts of el Haira, Mejenin, Raml, Saghia, Doga, and Terrgurt (with its branch of Guman). But the other names are from information given by the natives, and should be received with caution, because Arabs frequently describe a wadi by the name of a district it traverses, and not by that of the watercourse itself.

Of these wadis Iamar, Libetr, Serri, Doga, Dughun, Guman, and

Karathie appear never to have been noted by any traveller, or inserted in any map. On the other hand, Wadi Melgha, or Melghra, appears everywhere as the regular route to Beni Ulid, and, strange to say, though once or twice in the vicinity where it is supposed to lie, I could hear nothing of such a name. Terrgurt, Raml, and Msid are all known by name, as they reach the route on the coast from Tripoli to Khoms*.



WADI TERRGURT IN THE HILLS.

3. *The South Side of the Watershed.*

Crossing the watershed, we reach country of a different type; the chief feature in that part in which I travelled being the barren treeless plateau, about 1200 feet above sea-level, and therefore somewhat lower

* The information hitherto at hand is very confusing. In Barth's map, between Lagatch (Khoms) and Tripoli, we have—(1) Gerim, 13 miles west; (2) Terrgurt, 9 miles west of last (22 miles), and running from Jebel Msid, which is, of course, incorrect; (3) Msid, 5 miles west of Terrgurt (27 miles); (4) Raml, 4 miles west of Msid (31 miles).

The following distances of the seven wadis at their outlets to the sea, according to a modern inhabitant of Lagatch (Khoms), are in camel hours:—

1. Gerim					
2. Bin Jubara	...	...	...	...	6 hours (15 miles).
3. Terrgurt	...	...	...	...	8 hours (20 miles).
4. Msid	...	...	...	...	13 hours (32 miles).
5. Raml	...	...	...	...	16 hours (40 miles).

Wadi Msid would have no connection with Jebel Msid. Bin Jubara is Smyth's Benjara. Barth mentions Wadi Benjafara, but says, "Smyth's Benjara, which he seems to have confounded with Terrgurt." Della Cella puts Msid 7 hours from Tajura. All these wadis seem to make a big bend east between the hills and the sea.

than the crest of the watershed. This plain, though relieved to the south by numerous low lines of hills, drops gradually, while to the south-west it extends 20 miles to the western Tahrana range, where it merges into the Gharian district. In this direction the plain is badly supplied with water.

To the south or east, however, the traveller on his journey will find this plain broken by various watercourses running south or south-east, and it is only on entering these that he realizes that the plateau he has left is part of the hill range.

The main outlet of this system is the Wadi Targelat, which, taking its rise at Menshi,* on the Tahrana plateau, runs through districts called Ghirrah, Mamurah, and Tahwaleh to the sea at Kam, about 12 miles south-east of Lebda. All other wadis south of the watershed, including the broad Wadi Ueni coming from Jebel Maid, join it. There is also an intermediate group of wadis which meet in the Kaeia plain, from which there appears to be outlets both north and south, the latter falling into the Ueni and Targelat, and the former to Terrgurt or by some other route to the sea-coast.

4. *Wadi Targelat and the River Cinyps.*

Within the limits of these notes, there is no room for any discussion of the ancient geography generally of this part of the coast. The principal authorities are Pliny, Mela, Herodotus, Strabo, Scylax, and Silius Italicus, and from these and other sources we know the names of certain of the Libyan tribes of this part of Africa, and also that along the coast lay the towns of Abrotonum, Oea, Grapharn, Leptis Magna, and lastly a town of Cinyps, or Cinip, situated on a river and in a territory of the same name. The latter place, Herodotus tells us, was founded by Dorians the Spartans about 520 B.C.

On my arrival in the Ghirrah district of the Wadi Targelat, my inquiries showed that this wadi ran all the way to the sea at Tabia or Kam, the latter place being the one which has been identified ever since the days of the Beechey and Smyth with the Cinyps district. Unfortunately, I was unable to follow the wadi direct to the sea, but a later visit to its outlet set at rest all doubts as to the question.

The text of Herodotus is very clear and decisive on the subject of the Cinyps and its neighbourhood. "The Maesi adjoin them (the Garamantes) on the sea-coast westward." (He then describes methods of hair-dressing and armour.) "The river Cinyps, flowing through their country from a hill called the Graces (*χαριτων*), discharges itself into the sea. The hill of the Graces is thickly covered with trees, though all the rest of Libya is bare. From the sea to this hill is a distance of 200 stadia" (* Melpomene, 175). He also describes its intense fertility.

* Some say it rises in Gharian, in which case the Targelat at Menshi is only a tributary.

About 12 miles south-east of Leptis Magna lies, close to a bold headland marked on our charts as Ras el Tabia (but more generally known to the natives as Ras el Magro), a broad sunny plain, the black soil of which is evidently capable of great productiveness, though it still maintains the unhealthy reputation which gave name to the Cinyphian plagues; and across this winds slowly to the sea a sluggish stream, perhaps 40 paces wide, and the only river of Tripoli. This is the mouth of the Targelat, and the site that has long been identified as Cinyra.

But as all travellers are liable to error, so in this case two mistakes have been made by explorers which have ever since been perpetuated by geographers. The first affects only the modern name of the wadi, and the second (the most important) the distance from the sea at which it takes its rise. The real name of the whole wadi, as I have said, and as I proved by many inquiries, is Targelat; but every district it crosses has its own name, and the plain at the mouth is called Kam. This name Della Cella got hold of, and transferred to the wadi (Wadi Quam), and the same error, under different spellings, was made by the Beechys, Barth, and Smyth. In not a single work or map that I have been able to find does the real name of Targelat make its appearance.

The second error was more important, for it impeached the veracity of Herodotus, or of his copyists. Della Cella, who was here in 1817, thought that *χύνιστος* should be looked for in the last ranges of the Goriano chain (by which he seems to mean the lower slopes of M'salata and Tarhuna, for he calls, like most of the older travellers, all the hills Goriano), which, he says, "preserve the character . . . as being covered with trees," a description only applicable to the olive groves of these lower hills, and not to the now bare uplands about the Tarhuna plateau.

Admiral Smyth was here the same year, but did not publish anything about the Cinyra; but a few years later (1821-22) came the Beechys, who crystallized this error into shape. These explorers, coming by coast, made inquiries as to the source of the wadi, which they knew should be 200 stadia, or about 20 miles distant. No doubt they asked where Wadi Khahan (Kam) ended, and were told about 4 or 5 miles away, that being the point where the Targelat leaves its dry course among the hills, and crosses the plain. In that direction they saw a three-peaked hill, which they concluded would answer well for the "Hill of the Graces." They noted, however, that the "Terhoona" range would answer better to the 200 stadia of Herodotus, but considered that the inferior ranges intervening would be a barrier the Cinyphus could not penetrate. Some manuscript notes of Admiral Smyth, who seems to have hit on the same three eminences, confirmed them in this opinion, and consequently the river Cinyra has been set down ever since as identical with a Wadi Kam which has no existence.

The fact that, although the Wadi Targelat does not take its rise only

4 or 5 miles from its mouth, the perennial stream does, has no doubt partly caused the error; for at that distance there are springs, and above them the wadi is dry, except in storm seasons. It was these springs which gave the plain its fertility in ancient days, though no doubt at one time the upper Targelat contained, with all the other wadis in the hills, a regular stream of water.

From the identification of the Targelat, two results ensue. First, either the whole of the Tarhuna range was, in the time of Herodotus, known as *Χορίται* to the coast colonists, or else some particular eminences within that district—in either case, a point of great interest now we know what a wonderful series of remains still exists in Tarhuna; and, secondly, the charge of inaccuracy against Herodotus or his copyists may be removed.



THE ANCIENT LUTOS AT LEBUA (LEPTIS MAGNA).

With regard to the actual distance of the source of the Targelat from Kam, it is of course considerably more from Menshi and Gihirrah than 200 stadia, so that it is evident that this measurement was taken, not from the actual wadi head, but from the point it issued from the upper hills. And this would appear to be about where the range commences its slope to the sea, and at the point where the Wadi Ueni running from Jebel Maid joins the Targelat. So that this point was apparently considered by the geographers of the day the source of the Cinyps, and the hill range from which it came, farther west, the "Hill of the Graces."

5. *Leptis Magna* (Lebda).

The ruins of *Leptis Magna*, though but little visited now, and never properly described in any work of travel, have rather an archaeological than a geographical interest. Although in a sad state of ruin, much can still be seen. The cothon, or Phœnician harbour, is easily to be traced, and among the vast masses of ruin which surround it are fragments of temples, columns, custom-houses, and a great Roman circus, 470 paces in length. The country round is full of interest, for not only are there many mausolea, but the hills are capped with crumbling

FACADE AT LEBDA (*LEPTIS MAGNA*).

fortilets, probably of Roman date, and ruined megaliths of an earlier period.

By different ancient authorities *Leptis Magna* is termed both Tyrian and Sidonian, so that there can be little doubt as to its origin. It has been sometimes questioned why the Phœnician traders adopted the site in preference to the richer plain of *Cinyps* so near at hand. The colony was, as is well known, an emporium for trade with the great tribes of *Phazania* and *Libya*, but it does not appear probable that there was much difference in the accessibility to the interior from these sites. The choice was probably due to the colonists finding the mouth of the small *Wadi Lebda* especially suitable for the formation of their little galley-cothon; and also, no doubt, to the disposition at the date of the foundation of the tribesmen whom they came into contact with in the immediate vicinity.

6. *The Tribes of Tarhuna.*

Of the tribal Arabs of Tarhuna I gave some brief account in a paper last year, and there is, perhaps, not much which need be said now. Throughout Gharian, Tarhuna, M'alata, and Jafara, the type does not appear to vary greatly, although in jealousy and fanatical feelings towards strangers they differ widely. Especially do they dislike any discussion concerning their tribal divisions and districts, and it was only after much persuasion that I obtained the following list. These are the tribes of Tarhuna, numbering thirty-six, and the list is said to be complete. It was obtained from my guide, a leading man of the Hamamleh. The list should be compared with the list of nineteen given by Barth. Those I have starred, numbering twelve, are mentioned, though sometimes differently spelled by that author. The remaining seven names, which were not included by my informant, may be of tribes which have now left the district. They are placed at the end.

(1) Aulad Ali* (this is the great tribe); (2) Aulad Um Araf (there is Senam Araf in Wadi Doga); (3) Marghana*; (4) Mozaghwa; (5) Burkat; (6) Megagerah* (in West Tarhuna, near Jebel Jumma); (7) Zeraghna; (8) Drahb*; (9) Amamreh (there is Kasr Amamre, south-east of Knebat—Barth); (10) Meadi,* or Mehadi (there is Mehal el Meadi in Terrgurt); (11) Ferjane* (district of Ferjana); (12) Aulad Hamed*; (13) Hamamleh (sometimes at Menshi, sometimes at Ukirreh); (14) Awaseh; (15) Rhahaimleh*; (16) Shfatra*; (17) Zlas; (18) Hamadat*; (19) Amariin; (20) Bahalik; (21) Ariash; (22) Sualah; (23) Salala; (24) Ghannimieh; (25) Ferjane el Ghararah; (26) Duatino; (27) Aulad Tarhune; (28) Arabiin; (29) Gheraghta*; (30) Talah; (31) Haja; (32) M'saba (in Doga); (33) Khamudat; (34) Atershan (in Guman); (35) Gherarat; (36) Nanfeh.* [Welad Bu Sid, Welad bu M'areh, Welad Yusat, Welad Ra Sellem, Mata, Khwarish, Bu Saba.]

It may be noticed that the name of the Semait Arabs, mentioned by Leo Africanus as inhabiting the Tripolitan wastes, does not occur here. In the neighbourhood of Misrata, which is of course outside Tarhuna, there is a tribe who eat dogs, a custom always alluded to by the Tarhunis with disgust or derision.

7. *The Halfa Grass Industry.*

Of late years the demand for esparto, or halfa, has given a new occupation to the hillmen. The grass grows wild in many parts of the hills, both in Western Tarhuna and further west in the district of Jebel. The grass is gathered by hand, the harvester winding each handful round a piece of rough stick and jerking it away. Some say that this rough method is gradually extinguishing the crop; but it does not really appear that this is the case, for, if properly pulled, the grass is only drawn from the sheath, not torn by the roots. The trade was

begun at Tripoli in 1868, and at Khoms in 1873, and although there are funduks, or yards, at Tabia and Zliten, most of the grass is brought to the first-named places. The grass is conveyed on camels, one animal's net averaging about 4 cantars of 40 okes each. The price now realized at Khoms or Tripoli is 9 to 11 piastres a cantar; i.e. 36 to 44 piastres a camel-load, or about 8s.; whereas when the trade was young, the price realized to the Arabs was 25 piastres the cantar, which equals 100 piastres, or about a pound the load. This great fall is said to be due to the competition, there being about three firms engaged in the trade, one of which is English, and the others Jewish or native. The latter cut down profits to a minimum.

The tribesman who brings down a load of grass 20, 40, or even more miles to the coast, receives for it then about 8s. But prior to the sale the following charges must be paid: 1½ piastre per cantar to Government; 20 paras per net weighing duty; 10 paras funduk or warehouse charges.

He may, however, clear his 42 piastres, and this is what becomes of it: One-third goes to the owner of the land; one-third to the harvester; one-third to the camel-man for transport.

In other words, they each make about half a crown, of which the landowner has the best profit, for he has had no labour in tillage or transport or planting. But it is difficult to see how the camel-man and harvester can find it pay.

There are, of course, different qualities of halfa. The best is called "el arus" (the bride); the second, "secondo." The inferior qualities do not appear to have special names.

8. The Position of the pre-Arab Town of Tripoli before the Mohammedan Occupation.

If we look at the Admiralty chart of Tripoli, we get a good idea of its present position upon a promontory; but we have the evidence of Leo Africanus that traditionally it stood further north. This, however, has been disputed to some degree by modern writers, on the ground that outside the reef of rocks to the north we get into deep water.* The tradition, however, did not, I imagine, mean that the distance further north was great, and it may well be that those rocks were at one time joined to the mainland and built upon. There is also some evidence that the town extended further west along the shore; and, indeed, if it were not so, ancient Oua must have been a very small place.

* See Captain F. W. Beechey and H. W. Beechey; also Rae, 'The Country of the Moors.' And in this year, 1896, the question is commented on by Dr. Robert Brown in the new Hakluyt Society edition of Leo Africanus. All interested in Tripoli should study Leo's account of the city.

The following account of its capture by the Arabs seems not to have been noticed much, if at all, by modern students and travellers; but it is very important, as it shows that the hill on which the castle now stands was at that date clear of the town walls to the south.

The Arab historians, Ibn Abd el Hakim and El Leith ibn Said, narrate that the Arab general, Amr ibn Ali el Asi, camped on the summit of a hill to the east of Tripoli, and besieged it a.h. 23. From what followed, it is evident that this hill was the rock on which the Kasr now stands, and at that date it was outside the city. We are told that, after a month's fruitless siege, a hunting-party of eight left the camp and went west. "Returning home, it being very hot, they followed the sea-beach. In those days the sea came up to the extremity of the city walls, and between the sea and the city there were no walls, so that the Greek ships entered the port so far as to moor near the houses. The Arabs perceived that the sea, in ebbing near the anchorage, had left a space by which an entrance into the city could be effected. They entered the city to the cry of 'Allahu Akbar.' The Greeks had no other refuge but their ships, and Amr, who saw naked swords gleaming in the town, advanced (from the hill) and entered. The Greeks could only fly in their lightest ships, and Amr put the city to the sack."

This interesting account is probably in the main correct, but we may surmise that the hunting-party was in reality an organized surprise. Amr was on the summit of the castle rock, the only hill of any sort on the south-east, and thence he would, so to speak, look right into that part of the city now called *Homet Bab el Bahr*, which is also high. Amr's post was evidently clear of the city walls, which must have commenced from the sea, somewhere between the castle and the modern custom-house, and passed west through the centre of the present town, and joined the sea some little distance further west.*

The harbour, however, which could never have been a good one, must have been formed of the anchorage under the lee of Mendrik headland; but there may have been another anchorage west of the modern Tripoli, near where a Jewish cemetery now is. In bad weather Greek sponge-boats shelter here now. But betwixt this point and the Mendrik fort (the north side of the promontory) it seems doubtful if good anchorage for sailing-vessels could ever have been got.

9. *The Kaimakamlık and Mudirlik of the Hill Range.*

The following short list gives the above. At all the places mentioned there is a little garrison, and consequently a few built houses. All the native population live in tents or underground dwellings.

* Ancient foundations, culverts, passages, and substructures are numerous to the west of the town, in a piece of sandy cliff near the shore. They had probably something to do with the water-supply of ancient Oea.

		Residence.
M'salata	Kaimakam	M'salata
Tarhuna	Ditto	Kasr Tarhuna
Orfilla	Ditto	Orfilla
Misrata	Ditto	Misrata
Zliten	Mudir	
Taargha	Mudir	
Sirt	Mudir	
Gharian	Kaimakam	Kasr Gharian
Jebel	Mutasarif	Yefrin
Nallut	Kaimakam	Kasr Nallut
Kikela	Kaimakam	
El Hout (pronounced like "goat")	Mudir	

Altogether there are thirteen kaimakams and eight mudirs in Tripoli. The former get from 1500 to 2500 piastres a month; for the latter, 1200 piastres is the highest pay. Mutasarifs rank next to walis.

THE NOMADIC BERBERS OF CENTRAL MOROCCO.

By WALTER B. HARRIS.

IN describing a journey to Taflet and the oases of the North-West Sahara, the writer stated that never on his travels in Morocco had he come across any division of tribe of the Hamitic Shloh or Amazigh race who apply to themselves the name of Berbers. His recent journey, however, to a district lying south of a line drawn from Fez through Meknes (Mequinez) to Rabat on the Atlantic coast, has brought him in contact with a section of this people who do employ this term, of which the singular is "Berberi," and the plural "Beráber." This group of tribes inhabit a region that may be roughly described as Central Morocco, although on the west it extends almost as far as the Atlantic seaboard. Their northern boundary is the line above mentioned (Fez, Meknes, Rabat), though to the west of Meknes they extend slightly to the north. Their eastern frontier is a natural one, consisting of the northern end of the main chain of the Atlas mountains, while to the south the upper waters of the Um-er-Rbia, above Tedla, and more to the westward the plain to the north of the course of that river, form their limits. Five large and important tribes inhabit this region. Two others (Ait Tugardichen and Ait Yussi) are by the natives themselves included in the group, but as this paper deals especially with the nomadic tribes, and the author did not penetrate as far east as their country, but little mention need be made of them. The five tribes to be considered are, then, Zimmur, Gersan, Zaian, Beni Mtir, and Beni Mgild. Owing to their nomadic habits, it is impossible to

place them upon one map, for country which is filled with the Beni Mgild in winter becomes in summer the resort of all the other tribes, as will be described anon.

How nearly these Beraber are related to the Shloh people, the sedentary Berbers of the Atlas and trans-Atlas districts, it is difficult to say, but this much is certain—that, while of one common origin, they differ to a great extent in habits and language, though in a tongue like Shelha, which is very seldom written, and only in Arabic characters, there are always to be found many dialects. Yet the nomad Berbers can scarcely comprehend the tongue of their co-Hamitic neighbours, the *sedentary* tribes, though the language of the five tribes enumerated is distinctly one, although split up into dialects differing slightly one from the other. What, however, forms a more important break between the Shloh and the Berbers is the fact that, while the former, with the exception of the shepherds of some few Sahara tribes, are sedentary, the latter are entirely dwellers in tents, and for the most part nomadic. The Beni Mgild have, it is true, built some villages on the higher peaks of the Atlas, but these are only inhabited in summer, and entirely deserted as soon as the snows commence, when the inhabitants seek the lower and more element districts with their tents. It will thus be seen that this large tract of country—over 100 miles in length, and averaging some 50 in breadth—is almost devoid of any buildings, such as there are being entirely “ksar,” or fortresses, erected at various times by the Moorish sultans in their attempts to enforce their authority upon the people. How far successful they have been in this will be realized when it is pointed out that to-day, as always, the sultan, in order to travel from Fez, his northern capital, to Marakesh, the southern, is obliged to proceed *rid* Rabat on the Atlantic coast—a course that lengthens his journey by probably 120 miles or more, no small distance in a country where roads and bridges do not exist, and where his Majesty’s retinue number many thousands of persons. A glance at the two sketch-maps appended will show the respective positions of the tribes in winter and summer. The Beni Mgild, who in summer inhabit the highlands of the Atlas, descend in the late summer and autumn; and at the same time the four tribes of Zimmar, Gernan, Beni Mtir, and Zaian contract, leaving the lands they have held since the spring to the new arrivals. Unwritten laws exist as to the movements of these tribes. As soon as the ploughing is over, generally about the beginning of March, the Beni Mgild pack up their tents and migrate to the mountains; and the country they leave is almost immediately filled by members of the tribes that surround it, each having its specified share of territory. Three days are allowed to elapse after the departure of the Beni Mgild, before the other tribes enter the country. It will be seen from the maps that the two tribes of Zimmar and Gernan make but a very slight movement to the south,



SKETCH-MAP (NO. 1.) SHOWING THE RELATIVE POSITIONS OF THE FIVE NOMADIC TRIBES (IN LARGE ALPHABETIC TYPE) OF MOROCCO, AND OF THE ANNUAL SEASONAL MIGRATIONS.

U. S. GEOLOGICAL SURVEY



SKETCH-MAP (SO. E.) SHOWING THE RELATIVE POSITIONS OF THE FIVE SOMALI TRIBES (IN LARGE CAPITAL LETTERS) OF THE SAHEL, AFTER THE ANNUAL OPENING MIGRATION.

the Beni Mtir and Zaian sharing most of the region, in which they become in spring and summer neighbours, to be separated again in the autumn and winter by the Beni Mgild.

The district described above as Central Morocco consists, to the north, of a wide plain rising from a line drawn from Fez to Meknas (1500 feet altitude), to a range of foothills lying at an average of some 16 miles to the south. The altitude of Agurai, on the plain and immediately to the north and at the foot of this range, is 2200 feet above the sea-level, so that the plain rises some 700 feet in a distance of 18 miles (the distance between Meknas and Agurai). This line of hills, running parallel to the Fez-Meknas road, forms the northern side of the valley of the Wad Bet, a tributary of the Sebou, which river it joins in the tribe lands of Beni Hassan. East of the Bet is a second and higher range, known as Jibél Gadâruz, which appears to be an offshoot of the main chain of the Atlas, and, like the hills further north, has a general easterly and westerly direction. Whether the continuation of this range to the west of the Wad Bet is termed Gadâruz, the writer was unable to ascertain. A third line of hills, parallel to the other two, lies to the south of Gadâruz, but of considerably less elevation. The writer never ascended, even in the higher portions of Gadâruz, over 4300 feet above the sea-level, though the mountains round rose considerably above that elevation. The natives being all nomadic, there are but few spots that bear any distinctive name. The more productive springs and the "ksor," or fortresses, before mentioned, are the sole names that the writer heard. Of these "ksor," Agurai, some 18 miles due south of Meknas, is the most important. It is a small town, surrounded with walls of from 40 to 50 feet in height, and built of "tabia," or consolidated rubble. It owes its existence to Mulai Ismail, who held the throne of Morocco from 1722-1757. One gate alone gives entrance to the place, and in this respect, as well as in its architecture within and without, it much resembles the "ksor" of the Sahara described in the writer's 'Tadlet.' But it owns one feature of curiosity which was lacking in the desert, for almost without exception the entire population are descendants of the renegades and Christian slaves of the time of Mulai Ismail, with the addition of stray renegades who have been sent there since. Probably no such cosmopolitan place exists in the world, for its three or four hundred inhabitants are representatives of no less than thirteen nationalities. Each family remembers and is proud of its origin, the Arab equivalents being applied as surnames. The family in whose home the writer spent the few days of his visit were Flemish, while the next-door neighbour on one side was an elderly female, whose father, an Englishman, had become a renegade some eighty years since, and who quickly tired of it, leaving a wife and daughter, the neighbour in question. The other neighbours were the descendants of Spanish gipsies, the head of the family being "Absalam ben Mohammed el Gitano el Espanoli." They

were particularly proud of the "Gitano" (gipsy) part of the surname, and begged me not to confound them with the ordinary Spaniards, of whom there were many descendants in Agurai. The ancestor of this gipsy family was two generations back. He had left his country, they naïvely told the writer, because he was not on good terms with his sultan, who wanted to imprison him, being afraid of his influence. Probably it was more of an affair of the police courts than political intrigue. The "Ulad el Altuj" ("sons of the converts"), as the inhabitants of Agurai are called, have entirely, except in one or two cases, lost the type of their European ancestry, and through marriage, no doubt, are as largely Berber in appearance as the wild tribes that surround them. They speak amongst themselves both Arabic and Berber, and both, curiously enough, with a strong foreign accent, easily distinguishable. They are exempt from all taxation, but have to serve in the sultan's army, where they perform the duties of cooks and butchers. A certain quantity of land surrounding the "ksor" is theirs to plough, but their position on the very frontier of four Berber tribes is by no means an enviable one, and the little place and its adjacent market are constantly the scenes of bloodshed. Some 25 miles south-east of Agurai is Asru, another fortified "ksor," and the residence of a "kaid," or governor, of the Beni Mgild. The authority he possesses over his turbulent tribe, however, can be gauged when it is stated that he can never leave his castle without a large body-guard, and even requires a company of infantry, lent him by the sultan, to defend the walls from attack. The province of Zaïan possesses several of these "ksor," for the most part along the upper reaches of the river Um er Rbia, above Todla. The northern waters of this river appear in the maps as too far to the south, and apparently, instead of rising in Jibcl Ayashin, its source is considerably north of that mountain, nearer the north-eastern extremity of the Beni Mgild territory.

Every traveller who has visited Fez and Meknas must have been struck by the plunks and beams of the wood of the *Cedrus Atlantica*, which meet the eye on every side, and the handsome colouring of the native "arrar" wood (*Callitris quadrivalvis*). Of these two woods the entire timber-supply of Fez and Meknas consist, while large quantities also reach Marakesh and Rabat. In fact, the mountains of this district are almost the sole remaining forest land in Morocco, and here only, with the exception of the walnuts of the Southern Atlas, are really large trees found. On the northern range of hills, some 16 miles south of the Fez-Meknas road, the forests commence, but the cedar is only rarely found, the "arrar" being almost the only tree of any size, while the arbutus and laurustinus, lentiscus and palmeto form a dense scrub. As one proceeds to the south the cedar becomes more common, and almost the entire range of Gadâruz is thickly overgrown with specimens of magnificent size, the trunks of which, 4 feet from the ground, three

and four men cannot span. Fortunately, the primitive axes and adzes of the Berbers are useless against these giants, and so they escape, the medium-sized tree falling a victim to the woodcutter in their place. Of saws they have none, and the waste occasioned when every plank is hewn out of the trunk can be imagined. A large cedar, which would give at least eight or ten planks when sawn, produces at the most five when hewn. Yet the supply seems inexhaustible, owing to the difficulty of transport from any but the more accessible portions of the country, and the district is likely to remain, as it is to-day, one of the most beautiful forest scenes imaginable.

The Berber villages are all pitched in circles, the tents being of goats' hair dyed a very dark shade of purple, almost black, with the rinds and husks of the pomegranate. Into the circle are driven the flocks and herds of cattle at night-time, and the entrance, a space left between two tents, is closed by a hurdle of thorns. In this manner there is some immunity from the theft and raiding so common to the country.

The principal occupation of the Berber tribes is the tending of flocks and herds, there being, owing to the nature of the soil, but little cultivation. On the plain to the south of Meknæ and Fèz, a rich dark loamy soil appears here and there in depressions in the red sand, and is ploughed during the winter; while some of the valleys of Gadâruz, more especially the banks of the Wad Bet, produce good crops of wheat and barley. But the Berber is essentially a shepherd, and it is for the grazing of his flocks and herds that he spends the summer in wandering from spot to spot in the forest. The Beni Mitr, who spend the winter in the northern plain, retire to the forest as soon as the Beni Mgild have left it, and do not return until it is time to reap the grain which they have sown in winter. This same movement, only north instead of south, takes place in the tribe of Zaïan.

Some mention must be made of the tribe of Beni Hassen, which, originally of pure Berber stock, has become to-day almost an Arab tribe, the Shella language having entirely disappeared. The tribe inhabit tents, and in many parts thatch huts as well, and are looked upon with scorn by the more conservative Berbers, and are often even described by them as Arabs. They preserve, however, their warlike nature, and are celebrated thieves. They do not migrate, except, in places, to change to some adjacent spot their camping-ground, with the object of escaping the vermin in summer and the mud in winter, both of which collect around the tents from the number of animals which pass the night inside the circular villages. They are constantly at war with the Zimmur, and several pitched battles, to say nothing of cattle-raids, took place in 1896. In one of these over eighty lives are said to have been lost—no small number in a native fight. The Beni Hassen, like all other Berber tribes, are one and all good horsemen, and almost

every man possesses a horse. They will deny themselves almost the necessary food and clothing in order to possess a steed and a rifle.

Although the tribes enumerated above came of one common stock, and are closely allied, forming a distinct branch of the Berber race in Morocco, it must by no means be thought that they live at peace amongst themselves. Every tribe, and often the subdivisions of tribes, is at war with its neighbour, and at the "sok," or market, outside Agurai, which all patronize, so common has become bloodshed and murder, that to-day only the members of one tribe market at a time. As soon as they have completed their purchases or their sales, they mount their horses and ride away, leaving the scene free to another batch, who have probably been waiting their departure and watching them from some hilltop near by. The writer's presence at Agurai caused no little commotion amongst the people, for apparently no other traveller, at least in the memory of man, had preceded him; and the members of the tribe of Beni Mgild, who were in the market at the time, one and all anxious to question the "Rumi," as they call a European, refused to go, until the Zimmuris, seated on a hilltop, sent a message to the writer, asking him to disappear for a time, so that the Beni Mgild might depart, and thus give them a chance of marketing.

As a rule the Berbers of these districts are trustworthy, the system of safe-conduct—"zittat," or "mzareg"—being in force; but the many intertribal quarrels of the Beni Mgild render travelling, even to a native, very dangerous, and to a European, unless he can play the native satisfactorily, impossible. The writer travelled as a European in native dress, but in dangerous districts the members of the tribe by whom he was accompanied as "guarantees" took good care not to inform the general public of his nationality, though in a short space of time the rumour of his presence became general. He found the principal difficulty of getting about to consist in finding men whose influence was sufficient to take him through without risk of hostile demonstration or attack, though he saw nothing of either. In fact, in the parts where he was able to go at all, he was excellently received, and much kindness and hospitality were shown him.

THE GERMAN GEOGRAPHICAL CONGRESS AT JENA.

By HUGH ROBERT MILL, D.Sc.

THE geographers of Germany hold a Congress every second year in Easter week to discuss the progress of their science, and in particular the methods of geographical education. The meeting at Bremen in 1895 was briefly reported in the *Geographical Journal* for June in that year, and it was then decided that the twelfth *Deutscher Geographentag* should be held at Jena in 1897. While recognizing the distinctly

national character of this great German gathering, the Council of the Royal Geographical Society deputed me to attend as a representative of the Society—an expression of respect for the high development of geographical science in Germany. The importance of the meeting, and the hope of strengthening the interest in geography in the schools, if not in the universities, of this country, induce me to present to the Society a somewhat full report of the proceedings. One other foreign society, the Hungarian Geographical Society, was officially represented, and altogether, out of a total attendance of nearly six hundred, there were about twenty-five foreigners—many of these being American and Scottish students attending German universities.

In spite of the large number who assembled, many of the best-known geographers of Germany were absent; Professors Richthofen, Rein, Regel, Batzel, Crodner, von den Steinen, Count Pfeil, and several others, did not appear, several of them being abroad. The absence of Prof. Haeckel also made a notable blank. Prof. Neumayer of Hamburg, the President of the Congress, made up by his genial presence for many absentees, and the higher walks of German educational geography and allied sciences were well represented by Professors Futterer of Karlsruhe, Gerland of Strassburg, Hahn of Königsberg, Hettner of Leipzig, Kirchhoff of Halle, Kukenthal of Jena (the indefatigable president of the local committee), Naumann of Munich, Neumann of Freiburg, Oberhammer of Munich, Partsch of Breslau, Simon of Jena, Supan of Gotha, Wagner of Göttingen, Wahnschaffe of Berlin, and Walther of Jena. To these may be added Graf von Linden, Graf E. von Zeppelin, Graf M. von Zeppelin, Colonel Frobenius, Captain Kollm (the secretary of the Berlin Geographical Society and of the Geographentag), Dr. Lindeman, Herr Koldewey, and Consul Schenklank. Other names well known in current geographical work were represented by Doctors Baschin (the compiler of the Berlin Geographical Society's splendid annual bibliographies), Bludan, Halbfass, Hassert, Kailhack, Kretschmer, Oppel, Hans Meyer, Hermann Meyer, Phillipson, Römer (the local secretary of the meeting), Schenck, Schott, Ule, Wegener, and Zimmermann.

No other country can produce such an assemblage of scientifically trained students, teachers, and professors of geography, representing every department of exploration, research, and instruction. The neglect of geography by British universities is thrown into high relief by the consideration of such a list of names, and the ultimate fate of geography in this country, if such a state of matters is allowed to continue side by side with the progress in Germany, is cheerless indeed for Fellows of our Society to contemplate. The facts as to German work, and the richness of its results, are of course perfectly familiar from books, reports, and journals, but the unity, strength, and enthusiasm of the German geographers require to be seen to be fully realized. I do not for a moment suggest that German

methods should be transplanted, or even copied, in this country; but, having seen something of these methods and their results in their own fatherland, I feel it a duty to give expression to the urgent importance of wider recognition and encouragement of scientific geography in this country, so as to allow of the growth and ultimate prosperity of a distinctively British school. The greatness of our achievements in exploration in the nineteenth century must not be allowed to obscure the present slender prospect of pre-eminence for British geography in the twentieth.

Jena occupies a somewhat remarkable geographical position, standing on the flat valley of the Saale, where it trenches the Thuringian plateau, and surrounded by the picturesque hills into which the tributary streams have cut up the edges of the tableland. It is claimed, not without reason, as the heart of Germany, for it occupies the intersection of the two diagonals drawn from the north-eastern to the south-western, and from the north-western to the south-eastern, corners of the German empire. The limits of the ancient walled and moated town are traceable by the four streets still called *Graben*, which occupy the site of the old rectangular moat, within which the picturesque market-place and quaint narrow streets of the old town are crowded, while beyond them the modern town spreads in broad streets with spacious gardens across the river on one side, and over the lower slopes of the plateau edge on the other. The University has made Jena famous for the last three centuries, and the memorial tablets placed on the front of half the houses in the town—so it seems to a stranger—point out the temporary dwelling-places of famous visitors and residents, from Dr. Martin Luther in 1522 to Prince Bismarck in 1892. A certain industrial importance is given to Jena by the great glass works of Messrs. Schott and the world-renowned optical factory of Zeiss.

On the arrival of the geographers on Tuesday, April 20, they found the whole town expectant as for a visit of royalty. Triumphant arches, with an inscription of "Welcome," spanned the road opposite the two railway stations; scarcely a house was without its flags—the black, white, and red of the empire, or the black, green, and yellow of the grand duchy of Saxe-Weimar—and the market-place was beautified with Venetian masts festooned with evergreens, while freshly cut pine trees were placed on each side of the doors of the hotels. A reception committee met each train, and saw the visitors into the omnibuses for the hotels in which rooms had been allotted in advance. The office of the Congress in the Burgkellar was kept open until 11 p.m. for the supply of tickets, and each member and associate received with his ticket of admission a memorial volume, descriptive in verse and picture of the beauties of Jena, a packet of the postcards with local views, without which no German holiday is complete, and a free ticket for a special theatrical performance in Weimar.

Five sittings of the Congress were held for the reading and discussion of papers, the chair being taken at 9 a.m. and 3 p.m. each day, except on Thursday, when there was only the forenoon sitting.

The first meeting, at 9 o'clock, on Wednesday, April 21, filled the quaint old "Roseusäle," a large hall belonging to the University, and forming part of the curious old inn, the Rose, the headquarters of one of the students' corps. The officials of the Geographentag appeared in evening dress, with orders, and the proceedings were opened with great ceremony. Prof. Neumayer called upon Prof. Kükenthal, as president of the local committee, to take the chair, and the latter delivered a short address, welcoming the geographers to their twelfth German Congress. Herr von Pawel, the Chief of the Grand-ducal Department of Public Worship, welcomed the assembly on behalf of the reigning Grand Duke of Saxe-Weimar, and, in the course of his remarks on the benefits conferred by Geography on the state, observed, "Thank God that we have attained to this, that Germany is no longer a mere geographical expression, but a powerful and respected empire which has secured the spread of German science, German research, and German enterprise far beyond its own borders." The Grand Duke was also represented by his grandson, Prince Bernhard Heinrich of Saxe-Weimar; and his cousin, Prince Hermann of Saxe-Weimar, was present at several of the meetings. Prof. Löning, as representative of the University, welcomed the members, and expressed the full sympathy which the University felt with geographical researches, and the high appreciation in which geography was held as a central science enriching and deriving benefit from all other sciences. The last official welcome was delivered with the greatest heartiness by the Chief Burgomaster of Jena, who expressed his conviction that, in spite of the dullness of the morning, the heavens would smile upon the Congress—a weather prediction which was fortunately fully verified. Prof. Neumayer then touched briefly on the programme of the meeting, announced the chairman, vice-chairman, and secretaries chosen for the day, and declared the Congress open for work.

Prof. Neumayer presented the Report of the German Committee on Antarctic Exploration, which was appointed at Bremen in 1895, and has held several meetings, the last having taken place on the previous day at Jena. Recognizing that it is useless to expect Government aid, the committee resolved to appeal to the German nation for funds to carry out a great antarctic expedition, to consist of two ships equipped for three years. Prof. Neumayer expressed his gratitude for the amount of interest taken in the project by the daily and periodical press of Germany, and disclaimed any connection with another scheme which had been mooted for landing a small party of Germans to spend a winter at Cape Adare. He referred to the Belgian Antarctic Expedition now nearly ready to start, and also spoke of the prospect of a British

expedition under the auspices of the Royal Geographical Society. Such an expedition he felt sure would give a good account of itself, but he appealed to German patriotism not to neglect the present opportunity of leading the way in exploring so vast a region of the unknown. With regard to the German expedition, a definite plan was adopted in December, 1895, and still holds good. It contemplates observations in all departments of science, as well as geographical exploration. The region selected for making an attempt to reach a high southern latitude is that to the south of Kerguelen. The position of the observatories at Cape Town, Melbourne, and in Mauritius would enable meteorological and magnetic observations south of the Indian Ocean to be more completely utilized than if they were made at any other part of the unknown area. It is proposed to equip two vessels of about 400 tons, each with four officers, four scientific men, and a crew of twenty-two. The leader of the expedition is to be a sailor of thorough practical and scientific attainments, and the whole estimated cost is £47,500. At a later meeting the following formal decision of the committee was announced:—

"In order to bring the question to a definite point, a suitable leader of the proposed expedition shall first be found, and this will probably be done within the next few months. After the selection of a leader, the small executive committee, which has already been appointed, will immediately take suitable steps to raise the necessary funds."

The remainder of the morning sitting was occupied by a paper by Dr. Hermann Meyer (brother of Dr. Hans Meyer) on his recent journey in Central Brazil, and one by Dr. H. Zimmerer on German Exploration in Asia-Minor. The latter drew a vivid picture of the importance of German commercial interests in Asia-Minor, and dwelt upon the cordiality with which Germans are received by the Turks. The German name opened all doors, he said, and smoothed all roads from Jaffa to Constantinople; in Asia-Minor Germany is now *la grande nation*, to which the Turks look for the elevation of their country.

At the commencement of the second sitting, the chairman announced that the Prussian government had declined to accept the suggestions of the Geographentag that the contour-lines on the official map should be printed in colours, and that special evidence of proficiency in geography should be exacted of teachers of the subject in the higher schools; but that the governments of Prussia, Oldenburg, and Hamburg had agreed to the request that they should institute exact determinations of the changes of certain parts of the North Sea coast. The sitting was then devoted to questions of educational geography. Dr. Fischer, of Berlin, speaking of the position of geographical teaching in Prussian schools, expressed himself very strongly against the new regulations, which he characterized as a method for the wider deterioration of geographical teaching. Their result is that teachers without a specially attested knowledge of the subject are permitted to teach geography, and only

about half of the geography-teachers in the Berlin schools have qualified themselves as specialists in educational geography. This, of course, does not mean that they are without a competent general knowledge of the subject, probably better in all cases than that possessed by even the more intelligent English teachers.

Prof. Sievers, of Giessen, described his method of long geographical trips with advanced students, such as he had carried out in different parts of Germany. Each trip lasted about a fortnight, and not more than ten students were allowed to take part in it. Care must be taken to prepare those selected beforehand for what they were going to see, and to discuss what they have seen during the excursion fully afterwards. By such practical lessons alone could the full educational value of geography be utilized. The main obstacle to carrying out this system in schools is the expense, estimated at £5 per head for each trip, and Prof. Sievers suggested that the cost of this valuable adjunct to education should be paid by the State.

Prof. Palacky, of Prague, concluded the sitting by a paper on the method of establishing school herbaria.

The third sitting, which took place on the morning of Thursday, April 22, was devoted to geophysical questions. Prof. Gerland, of Strasburg, gave an account of the present position of Seismology, and urged the importance of establishing an international system of seismic observations by means of the horizontal pendulum. Prof. Supan, of Gotha, followed with a scheme for systematic earthquake observations. He pointed out that at present it was impossible to draw an earthquake-map of Germany. He held that, on the basis of practical utility, it was the duty of the State to establish seismological observations in the same manner as meteorological. This had been done in a very satisfactory way in Japan. A lively discussion followed the reading of these papers, in the course of which some difference of opinion as to the best means of establishing seismological observations appeared.

Subsequently the following resolution on the subject was adopted:—

"The Twelfth German Geographical Congress considers that the establishment of systematic seismological observations in all countries should no longer be postponed, and expresses the hope that the German Government will forthwith take the necessary steps in this direction. The method adopted in Japan may be recommended as worthy of imitation."

Dr. A. Schmidt, of Gotha, then read a paper on the geographical problems of terrestrial magnetism. He considered the question of the superficial distribution of magnetic conditions in regard to the hints it affords as to the internal structure of the Earth, and pointed out the importance of combining theoretical research in magnetism with practical observations of terrestrial magnetic conditions, in order to obtain the data essential to the solution of the problem. Dr. Neumann,

of Munich, dealt with the relation between geotectonic and magnetic conditions, illustrating his statements with references to his work on the geological and magnetic survey of Japan.

In the afternoon Professor Walther, of Jena, gave a demonstration in the geological museum, which occupies part of the castle in the north-east angle of the old town. He showed an ingenious arrangement to illustrate the wrinkling of the crust of the Earth by the reduction of its volume. A thin indiarubber balloon was inflated with air to about 8 inches in diameter, and provided with a pinch-cock, by which the air could be let out gradually when desired. The balloon was covered with a stiff paste of flour, dry flour dusted over the surface, and the air was then allowed to escape. As the balloon shrunk in volume, the smooth surface of the paste was thrown into irregular ridges and hollows, some of which strikingly resembled the orographical features of the globe. He also exhibited a model illustrating the geological strata, faulting, and erosion of the Thuringian region, by the adjustment of which it was possible to repeat in a general way the more important of the surface changes which the country has undergone. A relief-map of the district coloured geologically was also explained.

Later in the afternoon, the members of the *Geographentag* visited the Carl Zeiss Optical Factory by special invitation, and saw the whole process of the manufacture of lenses and prisms, the brasswork, and the final fitting up of microscopes, spectroscopes, photographic cameras, and, in particular, the new field glasses adapted for direct vision or for seeing round corners or over walls without exposing the observer.

On Friday morning, the 23rd, the fourth sitting, devoted to biogeography, took place. Prof. Semon, of Jena, dealt with the geographical problems the solution of which was facilitated by biological studies, with particular reference to his own recent work in Australia. The absence of the higher mammalian forms from Australasia proves that it was separated from the rest of the world in early Tertiary times, when also New Guinea was separated from Australia, the Bismarck archipelago being subsequently isolated from New Guinea. Tasmania must have been connected with Australia until Pleistocene times, and its inhabitants may have entered it by land. The contrast between the fauna of the east and west of Australia makes it probable that these were separated until the Pliocene period by deserts in the north, and marshes or the sea in the south.

Dr. Hahn, of Lübeck, read an entertaining description of the distribution of beasts of burden. He distinguished two classes—those which, like the reindeer, yak, camel, llama, and elephant, are restricted to certain definite regions; and those which may range over the whole world, such as the dog, horse, donkey, and ox.

Dr. Schneider, of Dresden, discussed a piece of detailed investigation which he had carried out on the fauna of the island of Borkum.

Dr. Roman Oberhummer, of Munich, presented the report of the Central Committee for the scientific geographical description of Germany, with which the name of Prof. Kirchhoff has been so long associated.

The fifth and final sitting took place on Friday afternoon. It was announced that the Thirteenth German Geographical Congress should meet in Breslau, and, in the event of the Seventh International Congress meeting at Berlin in 1869, the Committee had power to alter the date of the Breslau meeting to 1900.

Prof. Walther, of Jena, read a paper on the geographical features of Thuringia in relation to its geology, in the course of which he gave a brilliant description of the scenery of Central Germany. It was received with enthusiasm, and was certainly the most popular and by no means the least scientific of the communications to the Congress.

Dr. Karl Peucker, of Vienna, read a long paper on the shadows cast by mountains at different seasons, illustrated by numerous diagrams. The meeting concluded with a series of votes of thanks to the various individuals and bodies which had co-operated to make it a success.

The attendance at every sitting was large, and the attention of the audience remarkable. Of the 583 people who took part in the proceedings, no less than 358 were resident in Jena—a very significant fact bearing on the widespread interest taken in geography in the small towns of Germany. It is to be feared that the result of a similar meeting in a British University town during vacation would be somewhat different.

A word of special praise must be given to the reports of the meetings and the excellent abstracts of the communications published by the local daily paper—the *Jenaische Zeitung*. The efforts of the local committee ensured the smooth working of all the arrangements. While there is so much to praise, I may perhaps be allowed to note that the set of meteorological instruments exposed to public view, and presumably for public instruction, in a "Wetterhäuschen" on the Fürstengrabe is not a credit to the University before whose buildings it stands, nor to the town which is famous all over the world for scientific instruments of the highest precision.

The social part of the meeting was of the pleasantest kind. On the evening of Tuesday the 20th an informal welcome was given in the Burgkellar, where beer, tobacco, and the liveliest conversation were the order of the evening. On Wednesday night over two hundred of the members, including ladies, had a dinner in the Theatre hall, which was very tastefully decorated. The toasts were proposed between the courses, and, beginning at 7 p.m., it was long past midnight before the meal was brought to a close by the appearance of Usambara coffee, and cigars from the Cameroons. Two original geographical songs, composed by Prof. Leo Sachse, were sung with great gusto. Thursday's entertainment took the form of a social evening in the

Schwarzen Bär, the inn patronized by Luther in the sixteenth century and Bismarck in the nineteenth; and on Friday the last and best was a "Festkommers" given by the town in the Turnhalle. This was under the presidency of the genial Oberbürgermeister Singer, and was the occasion for many capital speeches, and a number of patriotic and geographical songs accompanied by a powerful band, and swelled by the voices of a large number of students, who were returning to the University for the summer term.

A special free excursion was conducted to Weimar on Saturday, and a performance of "Tannhäuser" given in the theatre so closely associated with the memory of Goethe and Schiller. There were frequent opportunities at Jena for short excursions to the surrounding heights, from which fine views of the district were obtained.

GEOGRAPHY AT THE UNIVERSITIES.

The following report on geography at Oxford during the past year has been received by the Council from Mr. H. J. Mackinder:—

"I have delivered three courses of lectures at Oxford during the past academic year, upon Central Europe, upon Britain, and upon the Far East. The attendances have been as follows: in Michaelmas Term, 43 undergraduates from 10 colleges, and 11 ladies from 2 colleges; in Lent Term, 41 undergraduates from 11 colleges, and 20 ladies from 4 colleges; in the Summer Term, 24 undergraduates from 7 colleges, and 18 ladies from 4 colleges. In addition, there were usually at each lecture one or two graduates and two or three students not attached to the University. A pleasant evidence that the work is not wholly without effect, is to be found in the fact that a tutor and his pupils in one of the colleges asked me to supplement my public teaching by giving to them a short course of private lectures.

"In conjunction with Mr. Chisholm, I again 'awarded' in the geographical examinations of the Oxford and Cambridge Joint Board.

"In London, I have delivered a course of 25 lectures at Gresham College on Europe, Asia, and Northern Africa. This course was organized by the London University Extension, and was subsidized by your Society. It was attended by some 200 teachers drawn from all parts of the metropolis. Half of the class wrote weekly essays for my assistant, Mr. W. G. de Burgh, of Merton College, and these were examined with satisfactory results at Christmas and Easter, by Mr. A. J. Herbertson, of Herriott-Watt College, Edinburgh.

"I have delivered 29 geographical lectures at the London School of Economics. The class, though small, was remarkable for the number of students which it contained from foreign universities, chiefly Russian, Japanese, and American.

"At the invitation of the Senate of University College, Liverpool, I have delivered, at that college, 5 lectures on the Teaching of Geography before an audience of some 900 teachers of all ranks. I have also lectured on the same subject at Tynbee Hall to about 150 London teachers.

"The period of ten years during which your Society has shared with the University the maintenance of the Readership in Geography is now ended, but the University has decided that the office shall not lapse. You will, I trust, agree that this justifies your policy.

"*May, 1897.*"

Mr. Yule Oldham reports as follows on the position of geography at Cambridge during the past year:—

"I have much pleasure in submitting a report on my work in the present academic year, in which a marked advance has been made.

"In the October term I was requested to give the first part of a course of lectures on the Geography of Europe for historical students. The attendance numbered 24, 7 being ladies. Nearly half of the class attended a supplementary series of lectures on cartography with practical work. At the second part of this course, in the Lent term, the attendance rose to 37, of whom 11 were ladies, either students from Girton or Newnham, or more advanced students from the Cambridge Training College. In addition, I lectured on Physical Geography for geological students; and in the Lent term, in conjunction with the University Lecturer in Geology, lectured on the Scientific Study of Scenery to an audience averaging 30 in number.

"My lectures for historical students were attended by 3 College lecturers, of whom 2 were members of the Historical Board, and, as a direct result of the lectures, Geography has received the practical recognition of being introduced as an essential part of the new revised historical Tripos.

"In August, at the meeting of University Extension students held here, I lectured to an audience of many hundreds on the Evolution of the Map of Africa; and last term I gave a short course of lectures, on the Teaching of Geography, to a large number of teachers and students at the Cambridge Training College.

"As one result of the success attending my lectures this winter, the Council of the University has granted a sum of £50 for the purchase of geographical apparatus, and this has been added to by a 'handsome donation of a similar sum from Dr. Nansen.

"To an important book on the 'Aims and Practice of Teaching,' recently issued by the University Press, I have contributed, by request, a chapter on the teaching of geography.

"There is every reason to expect that the advance made this year

will be maintained, if not increased, in the coming academic year, in a way which I hope will be deemed not unworthy of the considerable efforts made here by the Society:

* King's College, Cambridge.

"May 14, 1897."

ADMIRALTY SURVEYS DURING THE YEAR 1896.

Under the orders of the Lords Commissioners of the Admiralty, hydrographical surveys have been in progress round the shores of Great Britain and Ireland, on the west coast of Newfoundland, the Mediterranean, West Indies, east coast of North America, Bermuda, Tasmania, and Queensland; also in the South Pacific, among the Fiji group, and some of the other islands.

These surveys have been carried on by seven steam-vessels of war and three hired steam-vessels, manned by 69 officers and 639 men.

A naval officer has also been employed with the sanction of the Admiralty, under the Indian Government, in charge of the surveys in Indian waters. The results of this work accomplished are also mentioned here.

A detailed report of the labours performed by each surveying ship has been prepared, and, in accordance with custom, has been presented to Parliament.

The following is a brief summary:—

Notwithstanding the progress of hydrography, and the constant employment of our own and foreign surveying vessels in many parts of the world, the requirements of modern steam navigation increase more rapidly than the advance of surveys. Reports are constantly being received from various sources of the discovery of rocks and shoals, and during the year 1896 no less than 200 of these dangers to navigation required to be notified to the public by notices to mariners.

On the shores of the United Kingdom a detailed survey of Kirkwall, in the Orkney Islands, and its approaches, which had been commenced the previous year, was completed. In the Farns channel a series of observations of temperatures at different depths, and a collection of water-samples, were obtained, in continuation of former observations in the same locality. An apparatus, devised by Dr. G. H. Fowler, for the collection of living forms from definite depths, was also experimented with, with considerable success. By means of an improved form of Pillsbury's meter for observing undercurrents, a reliable series of tidal current observations of great interest was obtained, at depths from 100 to 110 fathoms.

The triangulation of the Firth of Forth, between Long. $3^{\circ} 2' W.$ and a meridian 2 miles west of the Forth bridge, was taken in hand, and a chart prepared, on a scale of 4 inches to the nautical mile, ready for sounding during the next season.

In the estuary of the Thames, the shingles patch in the Duke of Edinburgh channel was re-sounded, and in the Melway river, Gillingham and Pinop reaches were re-surveyed on a scale of 20 inches to the sea mile: also Long reach as far as Bishop's Ness, besides an examination of the Lapwell bank and other small examinations of various localities.

A re-survey of the Downs, Goodwin Sands, and adjacent coast, was carried out on a scale of 2 inches to the sea mile, and considerable alterations found to have taken place in the offlying banks since last examined in 1887. The Goodwin Sand has continued its general movement towards the coast, and the area of drying sand has largely increased.

In the Straits of Dover observations were made with the current-meter, those in the Pas de Calais showing that the whole mass of water, from the surface to the bottom, ran at the same speed and turned in its direction at about the same time.

The harbour and approaches of Newhaven were resurveyed on a scale of 20 inches to the sea mile, the result showing great changes near the piers, especially on their eastern sides.

An examination of the spoil ground at Spithead showed that the deposit from the dredges, which have been at work for two years in Portsmouth harbour, has made no appreciable difference in the depth.

A resurvey of Portsmouth, having become necessary on account of the extensive dredging that has been going on, was commenced, and a large portion completed on a scale of 20 inches to the sea mile.

On the coast of Ireland, Dungarvan bay has been resurveyed on a scale of 1·5 inches to the sea mile, several uncharted rocks being discovered there.

The whole of the harbour of Berghaven has been resounded, and no less than twelve previously unknown rocks placed on the charts, but none of them are situated in the anchorage ground for large ships.

A resurvey of Kilnary bay and approaches, including the main channel in, was made on a scale of 6·2 inches to the sea mile, and led to the discovery of several hitherto uncharted rocks.

At Westport, a plan of the bay and approaches was made, on a scale of 6·0 inches to the sea mile.

The dredged channels at the entrance of Lough Carlingford, and the positions of some lately reported rocks near Larne, were ascertained.

On the coast of Newfoundland, about 47 miles of coast, from Bonne bay towards Rich point, have been surveyed, as well as a portion south of the Bay of Islands. The results showed that the published charts of this locality were considerably in error, both in contours and positions. A small plan of Portland cove was also made.

In continuation of the off-shore soundings off the coast of Nova Scotia, to enable vessels approaching the coast to fix their position, an area of 1800 square miles was well sounded out, and much valuable information obtained.

The harbour of Louisburg, in Cape Breton island, which has become a coal-shipping port, was resurveyed on a scale of 8 inches to the sea mile.

At Bermuda, the survey of the Narrows, or Ship channel, was completed, parts of the bottom having been examined by divers. This survey has shown that with only a small amount of work, the passage can be made safe for the larger ships of the present day. Examinations were made of the Stag channel and Two Rocks passage, which have been lately dredged; and the Crawl and Bailey flats were sounded out, as well as a portion of the Great Sound.

At Belize, in British Honduras, a survey was commenced of the harbour and approaches, which already shows shallower water to exist in portions of the harbour than is at present shown.

In the Mediterranean, surveying operations have been carried on on the coast of Greece. In the Gulf of Corinth, plans on a scale of 6 inches to the sea mile have been made of Vostizza bay and ports Galaxidi and Salona, with the discovery of four previously uncharted rocks. The northern coast of the gulf between Psaromyia, Cape Nikolo, and Cape Volanidia has been completed on a scale of 2 inches to the mile, as also the southern shore from Gyphissos point to Argo peak.

Both telegraphic and chronometric meridian distances were obtained between Patras and Malis, and a telegraphic meridian distance between Patras and Corinth.

In Tasmania, a survey was made of Wedge Bay and the adjacent coast of the Tasman peninsula from Frederick Henry Bay to Port Arthur on a scale of 2 inches to the mile; and a triangulation completed of the south-east extremity of the Tasman peninsula.

On the coast of Queensland, the survey of the inner route has been continued and completed between Restoration Island in lat. $12^{\circ} 37' S.$ and Binstead Island in lat. $13^{\circ} 13' S.$ The Pearl reef, which has on several previous occasions been unsuccessfully searched for, having been originally reported by a small pearling schooner, was found. It consists of a small coral rock with only 19 feet of water over it, and as it lies almost exactly on the track of vessels using the inner route, its discovery will probably avert a disaster. Sectional lines of soundings outside the reef were obtained at the Grafton and Palm passages.

In the islands of the South-West Pacific, Funafuti Island in the Ellice group was surveyed on a scale of 2 inches to the sea mile, and the anchorage on 6 fathoms. At this island, Professor Solas, R.N., and a party were landed to conduct boring operations, which it was hoped would aid in elucidating the structure of coral atolls. These operations were carried out at two positions to depths of 100 and 70 feet respectively, when in each case they had to be abandoned owing to the presence of quicksand and boulders, which prevented further advance without special gear. Sectional lines of soundings were run out from the reef at several places round the atoll to determine its outer slope.

At Nukunak Island, also one of the Ellice group, a sketch-survey was made, and a sketch-plan of the anchorage.

The island of Rotumah and neighbouring islets was surveyed, and a plan of the anchorage made.

The north coast of Viti Levu, Fiji, with its extensive tract of off-lying reef, was surveyed between Nakorokoro point and Mathuata Island.

In the course of voyages and of searches for reported reefs, a large number of deep-sea soundings have been obtained in the South-West Pacific. Various banks were disproved, while others were verified and sounded, and a new bank was found. Magnetic observations have been obtained at Funafuti (Ellice group), Lavuka (Fiji), and at Curma on the Queensland coast.

In India, work was commenced on the Sind coast, and coast-line and soundings for 20 miles off shore completed between Kori and Godla creeks.

The eastern part of Bombay harbour was surveyed on a scale of 2 inches to the sea mile, and large-scale plans of the approach to the Government docks.

The north-east end of North Andaman Island was surveyed on a 1-inch, and Port Cornwallis on a 3-inch, scale.

During the year the Hydrographic Department has published 87 new charts and plans, and 20 plates have been improved by the addition of 25 new plans, while 4331 corrections have been made to the chart plates. The number of charts printed for the requirements of the royal navy, for Government departments, and to meet the demand of the general public has amounted to 344,118.

THE CENSUS OF THE RUSSIAN EMPIRE.

THE first general census in the Russian Empire, which was taken on February 9, 1897, is completed, and the collected materials are now verified on the spot, while a considerable portion of them has already been transmitted to the central Statistical Committee. The chief Census Committee has asked, in the mean time, all local

census committees to communicate to St. Petersburg the details of their results, which was done, partly by telegraph, for all provinces, with the exception of parts of the province Yakutsk, for which the returns had to be supplemented by estimates. The general items are now published in the *Official Messenger* (May 16, 1897) in the shape of two tables. The first table contains the population, according to the new census (males and females separately), for each of the eighty-nine governments and provinces of the empire, the superficies of the same, the density of population per square verst, and the percentage of females, as well as the total items for each province according to the ninth census of 1851, and the subsequent estimates of the central Statistical Committee for 1858 and 1885. The second table gives a list of the capitals of each province, and all towns having a population over 25,000.

Previous censuses, the last of which took place in 1851 and 1858, were made, for fiscal purposes, by the police, which gave the permanent residents and tax-payers at each spot. This was, on the contrary, a one-day census—the first made in all the Empire—in which every person which was in a given spot on February 9 (about that date in the villages) had to be mentioned in the house to house lists for that spot, whether permanently residing in it or not.

The general items appear as follows:—

	Population		Females per 100 males, 1897.	Density per sq. mile, 1897.
	Feb. 9, 1897.	1851 (Küppen).		
European Russia (36 governments) ...	91,188,750	52,707,985	102.8	8.0
Kingdom of Poland (10 governments) ...	9,442,590	4,352,053	98.6	30.8
Caucasia (11 governments and provinces)	9,723,551	4,452,152	89.5	8.6
Siberia and Sakhalin (8 governments and provinces) ...	5,791,732	2,457,184	90.7	0.2
Steppe region (5 provinces) ...	3,415,174	1,220,034	69.4	6.5
Turkistan, Transcaspian region and Pamirs (5 provinces) ...	4,175,101	—	63.0	4.4
Russian settlers and subjects in Bokhara and Khiva ...	8,412	—	60.0	—
Total, according to census ...	126,683,312	65,743,739	96.9	4.5
Grand Density of Poland (annual figures for 1897 and 1851) ...	2,527,801	1,630,915	102.2	3.2
Total, Russian Empire ...	129,211,113	67,380,845	100.0	2.5

It would thus seem that the population has nearly doubled within the last fifty years.

As to the density of population, it is highest in Poland (17.4 per square mile in Piotrków); next come South-West Russia (29.7 in Podolia, 28.8 in Kieff) and Southern Russia (23.1 in Poltava); while in Middle Russia the density is about eighteen per square mile, and of course very much more in separate districts.

The population of towns has rapidly increased lately, there being now nineteen towns which have more than 100,000 inhabitants: namely, St. Petersburg, 1,267,030 (with suburbs); Moscow, 988,610; Warsaw, 614,752; Odessa, 404,041; Lódz in Poland, 314,780; Riga, 282,943; Kieff, 248,750; Kharkoff, 170,082; Tiflis, 150,802; Vilna, 150,569; Tashkent, 156,506; Saratov, 133,116; Kazan, 131,508; Ekaterinoslav, 121,210; Rastoff-on-Don, 149,889 (149,201 with Nakhichevan); Astrakhan, 113,075; Baku, 112,253; Tula, 111,048; and Kishineff, 108,500. There are besides thirty-five towns having a population of over 50,000 inhabitants, and sixty-nine more towns whose population is in excess of 25,000.

It is, of course, very interesting to compare the previous estimates with the present definite data. Having carefully compiled, during the last ten years, for the 'Statesman's Year-book,' all isolated data concerning population that were published by the local statistical committees, relative to different years, and having calculated from these figures the estimated population, according to the probable increase, I arrived at the following figures for the end of 1895: European Russia, 95,750,000; Poland, 9,220,000; Caucasus, 8,800,000; Central Asia, 6,370,000; Siberia, 5,140,000; Finland, 2,460,000; total, Russian Empire, 129,530,000 ('Statesman's Year-book,' 1897). These figures were, as might have been expected, and is now seen, in default for Canada and Turkistan, as also for Siberia, and in excess for European Russia, the total differing from the census figures by about one per cent. only.

The census was organized and carried on by a special committee, under M. P. P. Semanoff, who was, in 1869, the organizer of the first one-day census in Russia—namely, at St. Petersburg—and has since developed the system in all details. A considerable number of men, many of whom were volunteers, took part in this immense work. Notwithstanding the considerable obstacles offered by the immensity of the territory and the difficulties of communication with the villages, the census was a decided success. There were, of course, some regretful incidents, due to the hostility of the population to all censuses, which are considered as preliminary to new taxes.

P. K.

THE MONTHLY RECORD.

EUROPE

The Gradual Extinction of the European Bison.—In the second number of volume III. of the 'Memoirs of the St. Petersburg Academy of Sciences' (8th Series—Physical-Mathematical Class), Eugene Büchner discusses the question of the gradual dying out of the *Bison bonasus* in the forest of Belowyesha (Lithuania), advancing statistics to show that such a process is really going on, and investigating the causes to which it may be ascribed. He gives tables showing the approximate numbers of the bison for each year from 1832 to 1892, from which it may be seen that, whereas from the former year to about 1855 the numbers were increasing, reaching a maximum of 1898 head in 1857, from that date onwards a diminution has on the whole been observed. The lowest figure (380) is given for the year 1889, but, as the writer shows that implicit reliance cannot be placed on the figures, the apparent slight increase since that year cannot be taken to show that a real improvement has set in. Herr Büchner discusses in turn the damage effected by various causes, such as the intentional killing of the bison, either by authorized or unauthorized persons; the despatch of specimens to various zoological gardens; the destruction by wild beasts, especially bears and wolves; the disturbance caused by the two Polish insurrections; the diminution in the area of the pasture grounds, and so forth. But, while allowing that many of these have operated in the past—the effects of the big "drives" set on foot for the capture of living specimens being especially detrimental—he considers that, with the increased care exercised in recent years for the preservation of the species, none of these causes are sufficient to account for the gradual progress towards extinction which is undoubtedly going on. He looks rather to the increasing unproductiveness of the bison themselves as the cause, and, dismissing various theories by which it has been sought to account for this characteristic, considers that it is due to the continual in-breeding which has of necessity been maintained. The same cause, he thinks, may account for the disappearance of the great post-tertiary mammals, which has never been satisfactorily explained, so that the study of the present condition of the Lithuanian bison may

lead to useful results with regard to the broad questions of the continuance or disappearance of species.

The Pinzgau.—Dr. William Schjerning gives a geographical description of the Pinzgau, one of the least-known parts of the Eastern Alps, in the last number of Kirchhoff's *Forschungen zur Deutschen Landeskunde*. The valley of the Salzach, between which and the High Tauern mountains lie the glaciers and highest peaks, does not lead to any pass like the valley of the Inn, and there has consequently been no traffic to open up the country. The Pinzgau has three distinct divisions: the limestone Alps in the north, reaching 8641 feet, whose jagged summits can be seen from Salzburg; the Salzburg slate Alps, 7765 feet, which lie immediately to the north of the Salzach valley, and the central chain rising in the Gross Venediger to 10,246 feet, whose peaks do not come into view until the upper valley of the Salzach is reached. These divisions are so marked that they have received special local names. The central chain is called the Kees Gebirge, or Glacier mountains; the slate mountains are called the Gras Gebirge, from their rich pastures; and the bare limestone Alps are called the Stein Gebirge. The illustrations have been chosen to show the results of weathering of the harder and softer rocks, as in the case of the granite mass of the Wilderglosspitze on p. 177, the smooth outlines of the Hundstein in the slate Alps on p. 97, and the bare Breithorn in the limestone Alps on p. 129. The upper valley of the Salzach has been much subject to inundations in former times, as a result of the felling of the lower forests, and many houses have been nearly buried by the rubbish brought down by the lateral streams; but the precautions of the Austrian government have made the valley secure against all ordinary floods. Small lakes are numerous in all three divisions except the limestone Alps, where the water cannot collect in this way. Most of them are the results of the Ice age. The largest glacier is the Obernzilzacher Kees, 1 mile by 4 miles, which lies to the south of the Venediger group. Like the other glaciers of the Pinzgau, it is diminishing. The limit of the snow-line is about 8844 feet in the south, and 8583 feet in the north. Not much is known with regard to the damage done by avalanches, which shows that the district has enjoyed a comparative immunity. The author deals, in conclusion, with the former existence of glaciers in the two other divisions, and the influence of the Ice age on the conformation of the hills.

Geographical Education in the German-speaking Parts of Europe.—

In the April number of *Petermanns Mittheilungen* there is a list of classes held and courses of lectures being delivered at the universities and higher schools in the German Empire and the German parts of Austria and Switzerland on geography and allied subjects during the summer session of 1897. From this list it appears that 85 professors in the German Empire, 20 in Austria, and 9 in Switzerland are engaged in such work, and if we omit the courses in geology and meteorology, and general courses in statistics, anthropology, and ethnology, we find 51 professors in the German Empire, 11 in Austria, and 5 in Switzerland, giving courses in subjects that may be held as belonging more strictly to the domain of geography, the number of courses being 98, 17, and 15 respectively. Of these courses, 6 are on the Determination of Positions, 5 on Mapping, 1 on the Determination of Altitudes, 1 each on the Distribution of Plants and Animals, 4 on Historical Geography, 4 on Commercial Geography (3 in Germany and 1 in Switzerland), 4 on Colonial Policy, and 2 on Applied Statistics, and 22 of the courses are classes held for geographical exercises. It would shed an instructive light on the difference of the estimation in which geography is held as a branch of the higher education in this country if we had for comparison a similar list for the United Kingdom, and in the absence of such a list it may be worth while to point out that in the list of University Extension summer courses given in the April number of the *University*

Extension Journal, there are only 5 geographical courses, and even if we double this number so as to take into account the courses held after lectures, which may be compared to the exercise courses mentioned above, then we have only 10 summer courses in England (in addition to any regular university courses that may be going on) to compare with the 131 courses in German Europe.

ASIA.

Illustrations of Ceylon Antiquities.—In his superbly illustrated volume recently published, Mr. H. W. Cave gives the results of a tour made in 1895 for the purpose of examining the antiquities of "Lanka," the sacred land of Buddhism, the story of whose golden age reads more like a chapter of romance than a record of sober historical facts. Familiar as parts of the island paradise of the East have become to Englishmen of the present day owing to the facilities afforded, even to passing visitors, for obtaining a glimpse of the picturesque scenery of the interior, to the majority even of actual residents in the island, the ruins of ancient cities, situated in the more northern districts, with their wonderful rock-hewn temples, remains of palaces and monasteries, sculptured statues and carved work of various kinds, are known only in name. Mr. Cave's lucid descriptions, together with the large number of excellent illustrations reproduced from his own photographs, give a vivid idea of the architectural wonders lying hid among the northern jungles, and will, we doubt not, arouse a wish in many of his readers to make a personal inspection of these interesting relics of the past. One cannot but be struck with the contrast exhibited between the former history of the island and its condition within the last few centuries, and we ask with wonder what was the race of men whose genius raised these mighty structures, and who lived in a state of culture so different from that of their degenerate successors at the present day. The answer is in this case supplied by history, for, as Mr. Cave points out in the opening chapter, not one of the ruins dates back further than the introduction of Buddhism into Ceylon, but they may all be ascribed to the outburst of religious enthusiasm which followed on that event, and which permeated with its influence the whole life of those ancient cities, as witnessed by their existing ruins. The sacred city of Anuradhapura was, as is well known, the centre of the kingdom when at the zenith of its prosperity, and naturally the greater part of the book deals with its edifices, among which it is difficult to say which most impresses the imagination. The *Kaanwel Dagaba*, shown on Plates xiv. and xv., is a fine example of the stupendous structures which compare in size with the very hills themselves. Specimens of carved work may be seen in the cluster of pillars shown on Plate xviii., whilst the picture of the *Ierumuniya Temple* (Plate xii.) gives an instance of the massive simplicity attained by hewing the solid rock. Equally striking and less known are the antiquities of *Sigiri* and *Polonnaruwa*, which could only be reached by rough jungle tracks. But to gain an adequate idea of these or any of the ruins, Mr. Cave's photographs must be consulted.

A Recent Journey in Korea.—The report of a journey across Korea, made in the autumn of 1895 by Mr. Willis, assistant in the British Consulate at Seoul, accompanied by the Rev. S. O. Warner, a missionary, has been kindly forwarded to us by the Foreign Office. The route led through the province of Kang-won, one of the least known in the peninsula, keeping considerably to the east of the main road from Seoul to Wonsan, followed by Mr. Carver, Mr. Campbell, and other travellers. At about 15 miles from the capital a hilly country was reached,

* * * *The Ruined Cities of Ceylon*. By Henry W. Cave, M.A. Illustrated with photographs taken by the Author in the year 1895. London: Sampson & Low. 1897.

consisting of a succession of confined valleys, shut in by steep well-wooded hills. The population was scattered in small hamlets, and the amount of cultivation was small. The northern branch of the Han river, down which Mr. Willis learnt that a considerable amount of grain passes at one season of the year, was repeatedly crossed. The Kang-won province was reached by a pass about 1200 feet high, and after crossing the well-cultivated plain of Chun-chou a hilly country was again reached, the wider valleys containing small country towns, at which fairs are held two or three times a month. In spite of the general squalor of the dwellings, evidences of agricultural prosperity were noticed, and British piece-goods were found to be in favour. The country, however, is totally destitute of roads. Mr. Willis and his companion spent two days in crossing the mountain chain that runs parallel to the east coast, and has here an average height of 2500 to 3000 feet. The scenery was exceedingly wild and varied, the path now leading along the bed of a mountain torrent, and now ascending the mountain side through forests of oak, pine, and maple. Except an occasional hunter or woodcutter, the only inhabitants are monks, who have several large monasteries in the district. Having reached the east coast—here open and exposed, but with now and then a fishing hamlet protected by a low promontory—the travellers struck inland in order to visit the monasteries of the Diamond mountains, and soon joined the route travelled in the opposite direction by Mr. Campbell in 1880, the last part of the way to Wonsan (Gensan) leading along the high-road from Seoul. In spite of the recent development of trade of Ping-yang on the western side of the peninsula, towards which most of the imports and Wonsan formerly went, the latter port was in a particularly flourishing state in 1895, principally owing to the recent discoveries of gold in the Han-kyong province. Mr. Willis returned to Seoul by a coasting steamer, and was thus able to learn something of the possibilities of the coasting trade. Massampo, on the south-east coast, possesses an excellent harbour, though the place has apparently no great commercial possibilities.

The Geology of Java.*—This book contains a detailed account of the author's work of geological exploration, extending over six years of actual surveying. It is an official publication of the Dutch government, and forms, in connection with the synoptical geological map of 1:200,000, on which it serves as a commentary, the latest and most complete information on the geology of Java and Madura, which is geologically a part of Java. Owing to the improbability of a more complete geological survey leading to the discovery of useful minerals which would pay the expenses of such a work, the author has been obliged to content himself with a general sketch of the geology of Java, with a more detailed description of certain districts. It is unfortunate that a book of nearly twelve hundred pages, containing such varied material, is unprovided with an index. Owing to the great length of Java, which is approximately the distance from Paris to Vienna, and the fact that the political residences do not correspond to geological boundaries, two great divisions have been made in the work. The first, which forms the main body of the book, deals in detail with the geological formations of each residency; the second with the general geology of Java. There is also a special section on useful minerals, and a catalogue and description of many characteristic rocks and fossils in the Batavian museum. Except petroleum and building-stone, which are at present worked in small quantities, the result of the survey confirms the belief in the non-existence of mineral resources of commercial value. There is a bed of coal of some extent in the south of Bantam, but its position is too unfavourable

* *Description Géologique de Java et Madura.* Par Dr. R. D. M. Verbeek et R. Toussaint, Ingénieur en chef des mines des Indes Néerlandaises.

to make it probable that it will ever be worked. Madura, which is described as one of the residencies, has no mountains, the highest point being 1344 feet, but has a large number of rivers on the whole more navigable than those of Java. It is noticeable that these rivers rarely possess a name of their own, but change according to the villages on their banks. Java is very largely mountainous, having fourteen peaks over 9800 feet, and forty-five over 6500 feet. The majority of the volcanoes of Java were active in the Tertiary epoch, and, though it is not quite true to say that there have been no eruptions of lava in recent times, there have probably been none of great importance. The eruption, however, of the neighbouring volcano Krakatau in 1883 shows that great eruptions are not limited to prehistoric times. As a rule, however, these eruptions have been confined to volcanic dust and ashes, which have gradually hidden the old craters, and formed the conical hills which are so prominent a feature in the scenery. The older the volcano—that is to say, the longer since it ceased to be active—the less perfect is the form of the crater owing to erosion. The heaping-up of material and flow of lava round a central point destroys in most cases the old form of crater; but in Java, as in Sumatra, there is a certain number of embryonic volcanoes which ceased to be active soon after they were thrown up. All the summits above 6500 feet, and many of less altitude, are volcanic. The disintegration of the volcanic rocks also produces great fertility of the soil. In quaternary times Java was joined to Sumatra, and it would only be necessary for the ocean bed to raise about 25 fathoms to re-establish the connection.

The Danish Expedition to the Pamirs.—This expedition, which was headed by Lieut. Olfen, has returned to Copenhagen after a year's absence. Some details respecting it are to be found in *Das alte Weltteil*, 1896-97, p. 334, and in the *Comptes Rendus* of the Paris Geographical Society, 1897, p. 103. The exploring work of the expedition was directed chiefly to the country between the Pamir-daria and the Panj, which had been hitherto untraversed by white men. The mountains of this region reach a height of 14,000 to 16,000 feet, and are broken by many streams flowing to the Panj. The expedition is said to have discovered a primitive race of small stature, living in caves and stone huts, and using no other weapon than the crossbow, with which, however, they are very expert. One account says that their domestic animals are also marked by their extremely small size.

Exploration of Lake Baikal.—A hydrographical expedition for the exploration of Lake Baikal, under Lieut.-Colonel Irishanka, started on May 8 from St. Petersburg. It expects to begin its work in a fortnight, and to return in October. Soundings of the lake, surveys of the coasts, and natural history explorations are to be made.

Emigration to Siberia.—According to a work, just published, by State Secretary Kulomzin ('Statistical Data Relative to Siberia'), no less than 173,044 persons emigrated from European Russia to Siberia during the first ten months of 1890. Of those, 161,411 emigrants took the Siberian railway, and the remainder went by steamer, from Tiumen to Tomsk. The emigrants are chiefly peasants from the governments of Kurak, Kharkoff, Penza, and Chernigoff, where, owing to the increase of population, the land allotments become very small.

Dr. Sven Hedin's Journey in Tibet.—The Russian Geographical Society has received news from Dr. Sven Hedin, stating that he has made a successful journey across Northern Tibet by a route somewhat to the south of Pyrtsofa. Twenty-three new salt lakes are said to have been discovered en route. The journey was continued by way of Moungolia to Peking.

AFRICA.

A Tour through British Central Africa.—The *British Central Africa Gazette* for March 15 contains the account of a journey to lakes Tanganyika and Mweru by Mr. John Gibbs, manager of the African Lakes Corporation. It was made with a view to inspecting the various stations of the company, and inquiring into the prospects of trade generally in the country with which it has dealings. Mr. Gibbs's narrative gives a striking idea of the progress which has been made in the opening up of the country within the last few years, flourishing trading and mission stations being scattered over its length and breadth, in addition to those occupied by officers of the administration.* Substantial brick houses have been built in many parts, and more are in course of construction, while experiments in the cultivation of European vegetables have met with considerable success. It has been proved, also, that horses can be imported to the Nyasa-Tanganyika plateau from the coast. Mr. Gibbs extended his journey to the north end of Tanganyika, visiting the Belgian and German stations on the lake, and receiving a cordial welcome from the officers in charge. He everywhere found trade increasing, and showing unlimited possibilities of further development. Throughout the British territory the natives had settled down to peaceful occupations, and were living on good terms with the white men.

The French in the Bend of the Niger.—The political activity of the French in the regions of the Niger shows no signs of abatement. Anxious to secure a continuity of territory between the upper Niger and Dahome, they have long regarded Mossi as an important point to be occupied, and to this end expeditions were sent both from the north and south to converge on that kingdom. The *Bulletin du Comité de l'Afrique Française* for April gives some account of these expeditions. That from the north, under Lieut. Voilet, has occupied Wagadugu, the capital of Mossi, while that from the south, under Lieut. Baud, is said to have confirmed French influence in Gourma (also claimed by Germany), and joined hands with Lieut. Voilet on the frontier of Mossi and Gourma. A third expedition, under Lieut. Benmonot, has occupied Bussa, on the middle Niger, claimed by the Royal Niger Company.

Dr. Schoeller's Expedition in East Africa.—A note in the fourth number of *Petermann's Mittheilungen* for the present year records the progress made by Dr. Schoeller in his expedition to the Victoria Nyanza and Uganda (*Journal*, vol. iii, p. 175). He is said to have made a careful survey of his route, which led through some of the least-known districts on the east side of Lake Victoria. From Kilimanjaro he reached Kavirondo by way of Letiko and Laitwa.

German-Portuguese Boundary in East Africa.—According to the *Deutsches Kolonialblatt* for April 1, the German-Portuguese boundary in the neighbourhood of the Roruma mouth has been finally fixed by a mixed commission of the two countries, an alteration of the line as at first fixed having been shown to be necessary by the final testing of the astronomical observations. A map of the district, showing the details of the boundary, is promised in the *Mittheilungen aus den Deutschen Schutzgebieten*.

Dr. Baumann's Survey of the East African Islands.—Dr. Oskar Baumann, now stationed at Zanzibar as Austrian Consul, has done a useful piece

* We have received from Mr. Alfred Sharpe a map, by Bartholomew, showing the sphere of action of the African Lakes Corporation, with its various stations and those of the different missionary societies at work in the country.

of work in carrying out a careful survey of Zanzibar and the other islands lying off the East African coast. The work was performed with the support of the Leipzig Geographical Society, and the results, so far as relate to Zanzibar and Mafia, have already been issued as part of the scientific publications of that Society. By traversing the islands in all directions, Dr. Baumann obtained a clear general idea of their physical features, which are well shown on the maps which accompany the monographs. The distinction between the rocky coral formation, little suited for cultivation, and the alluvial or sandy soil, derived from the denudation of the former, is shown by a difference of tint (on a small inset map in the case of Zanzibar). Both in Zanzibar and Mafia the coral limestone occupies the eastern side, but, whereas in the former it includes more than half of the breadth, in the latter it is confined to a narrow strip along the east coast, with a continuation in the smaller islands to the south. The coco-nut plantations, which form the chief wealth of Mafia, are further shown by a distinctive tint, and in the case of Zanzibar, the clove-producing area, which lies chiefly to the north of Zanzibar city, is distinguished from the rest of the fertile portion of the island. Dr. Baumann's letterpress, which is intended as an explanatory supplement to the maps, gives a clear description of the surface features and topography of the islands, with sections dealing with the inhabitants, commercial and other resources, etc. In Zanzibar the coral limestone shows many of the features of a "karst" region, such as "chimneys," caverns, and underground streams. A good plan of Zanzibar city is given, though this is but briefly touched upon in the description, owing to the fact that more information has previously been available with regard to it than on the rest of the island.

The Population of Réunion.—M. L. O'Zoux gives, in the *Revue Française* of January last, a sketch of the various constituent elements in the heterogeneous population of Réunion, briefly describing the characteristics of each. The Malagasy are decidedly the best and most reliable labourers, the Hindus being said to be here characterized by idleness and drunkenness, although capable of severe labour. The negroes too are intemperate, and their delicate constitutions render them less useful as labourers than the Malagasy. The Chinese and Arabs dwell in the capital, either rice carrying on its own special kind of trade. The Creoles—French emigrants from Normandy or Brittany, officials or traders—show much energy and application, and are marked by the close bond of union between the members of the family. Of late years a mulatto race has sprung up, which, though it makes its way slowly and is looked down upon by the Creoles, is bound in time to force its way to the front, and all the more readily as the days of large fortunes are over in the island, and equality is now the order of the day.

Reported Death of Captain Böttego.—Telegrams from Zeila, said to be based on a letter from King Menelik himself, give the regrettable intelligence of the death of Captain Böttego in the south of Abyssinia, in a fight with the natives. The fight is said to have been occasioned by the opposition of an Abyssinia chief to the entry of the Italian expedition into his country from the Galla countries to the south. By pushing his way so far north, Captain Böttego must have performed a good piece of exploring work in this, as in his previous journey, and his untimely death is all the more to be regretted.

AMERICA.

The Physical Features of Missouri.—The Missouri Geological Survey has recently issued, as an extract from its reports, a paper by Mr. C. F. Marbut, one of its assistant geologists, and an enthusiastic disciple of Prof. W. M. Davis. Mr. Marbut gives a detailed topographical description of the state of Missouri, referring

the features described to the principles of land structure and development of which Prof. Davis and Penck are the recognized exponents, and his memoir is an admirable example of what physical geography, properly understood, can really accomplish—an example such as is, unfortunately, still rare in this country. The great feature of Missouri is the undulating upland plain, which presents an even surface rising and falling gently without any outstanding elevation, and forming a great block, from which have been carved the valleys of the existing streams and the broad shallow depressions, which extend along the strike of the softer rocks, and are due to their rapid degradation. The Missouri river roughly divides the upland region into two parts—the prairie region lying to north and west of it, and the Ozark region to south and east. Various hypotheses have been brought forward to account for the formation of this upland. Mr. Marbut adopts the view that the upland surface is a peneplain of a former cycle of erosion completed in middle or late Tertiary times, and that it was produced at a level lower than that at which it now stands, the present details of relief having been cut so rapidly and so recently that there has been no material reduction in the upland surface during the process. The fact that the Missouri drainage has been inverted within recent geological times is assumed from the evidence, but difficulties arise because it is not possible to fix the date of the inversion. If it took place at the beginning of the present cycle of erosion, then it follows that the prairie region was unequally elevated; there was no minor warping to speak of within the limits of the state, but the upheaval was greatest in the north-west, toward the Rocky mountains, and least along the border of the Ozark region. The "Ozark dome" was raised most along the present axis of greatest elevation, decreasing in amount in all directions, and it is a warped surface, the warping having occurred in the beginning of the present cycle, in middle or late Tertiary times. Having thus traced the initial condition of the upland, Mr. Marbut proceeds to point out how "step and platform" topography is developed by erosion of hard and soft rocks, in a manner largely dependent on the dip of their strata, to apply this scheme of development to the various platforms and escarpments—about half a dozen of each—found in Missouri. Then follows a note on the swamp region, a kind of exception found on the Tertiary rocks of the coastal plain, which extends from the south-eastern border of the Ozark region southward into neighboring states. Finally, the development of the hydrography of the area on the upland plain is followed in detail. The terms "meander" and "shut in," and the like, have a definite enough geomorphological meaning, as appears clearly from Mr. Marbut's use of them, but we cannot help feeling that they sound crude and angular, more conformable in style to the German language than to our own. Possibly they may be improved in this country, in the event of the ideas they are meant to express becoming familiar to British students. It should be mentioned that Mr. Marbut's paper is illustrated by very satisfactory photo-engravings, and much less satisfactory maps.

Areas of South American River-basins.—The discrepancies in the figures given in geographical hand-books and text-books for the area of the larger river-basins outside of Europe have induced Dr. Alois Blüden to enter upon a new calculation of those areas based on the best available maps, and he contributes to the April number of *Petermanns Mittheilungen* the first results of those calculations. These embrace the river-basins of South America, and are based on the six-sheet map of that continent, on the scale of 1:7,500,000, in Stieler's Hand-atlas. The calculation has been made in the usual way, partly by reckoning the entire degree-measures included in a river-basin and multiplying out, and partly by measurement of the surplus fractions not filling an entire mesh. For this measurement he

has made use of Coradi's compensation polar planimeter. To afford some criterion of the accuracy of his measurement, he has not confined himself to the larger river-basins, but has included the smaller basins in groups, so as to make up the entire continent, and he thereby finds that his aggregate area is only 24,000 square kilometres (9265 square miles) short of the total area found for the continent by Wagner's latest calculations ('*Beiträge zur Geophysik*, ii. pp. 699, 700). Below are given the results of Dr. Blüden's calculations for South American river-basins converted into square miles; but, as Dr. Blüden's figures are only for the nearest multiple of 1000 square kilometres, in the conversion the equivalent is given only for the nearest multiple of 500 square miles, and any discrepancy that may thus result between the total as obtained by conversion from Dr. Blüden's totals and the sum of the individual areas is not rectified:—

A. GENERAL SYNOPSIS.		Sq. miles.	
1. Atlantic domain	Sq. miles.	Brought forward ...	Sq. miles.
2. Pacific	6,284,000	11. Maritime tract between	3,710,500
3. Region of inland drainage ...	467,500	Paraná and São	
	103,500	Francisco	100,500
	6,795,000	12. São Francisco	201,500
		13. Maritime tract between São	
		Francisco and La Plata ...	333,000
		14. La Plata with Uruguay ...	1,198,500
		15. Colorado (Gobernador	
		and Rio Negro (Curru-	
		León)	164,000
		16. Chubut and all other rivers	
		to Cape Horn	210,000
			6,284,000
		C. PACIFIC DOMAIN.	
		17. Pacific slope of Colombia ...	35,000
		18. " " Ecuador	44,500
		19. " " Peru	125,000
		20. " " Chile	206,000
			410,500
		D. REGIONS OF ISLAND DRAINAGE.	
		21. Basin of Lakes Titicaca	
		and Aullagas	76,000
		22. Region to south of pre-	
		vious basin	30,000
			106,000
		Carried forward ...	3,710,500

The Mineral Resources of Alaska.—By the courtesy of the Foreign Office, we have received a copy of a report lately made to the United States Senate by the Director of the Geological Survey, on an exploring expedition sent by that department in 1896 to the region of the Central Yukon, for the investigation of the gold-bearing formations of Alaska. The area reconnoitred by the expedition, which is shown on a sketch-map accompanying the report, comprised upwards of 30,000 square miles of country not previously examined by the geological survey. Mr. E. J. Spurr and two assistants crossed the Chilkut pass in June of last year, and passed down the Yukon to its mouth. During the passage through the gold-belt, which occupies the country within the great bend of the river, afterwards passing in a north-westerly direction to the northern bank, all the creeks and gulches known to be productive of gold were visited, in some cases by land journeys of several hundred miles. The gold-bearing formations consist of highly altered rocks, mostly

crystalline schists, probably in part of Devonian age. The gold occurs both in the quartz veins with which the rocks are traversed and in "placers" formed by the wearing away of the older rocks. In the vicinity of the latter the placers are sufficiently rich to be profitably worked. In the younger rocks of the district beds of very pure lignitic coal have been found, which will probably prove of great assistance in the development of the country. Other valuable minerals, including silver-bearing lead and copper, occur in many places. The gold belt extends into British territory, but so far the miners—of whom about two thousand were at work in the Yukon district in 1896—have preferred the American side. The co-operation of the two governments is recommended with a view to opening an overland route to the district, that suggested by Mr. Spurr leading from Juneau by the Chilkat pass to the Yukon-Pelly junction. Efforts will be made to extend the reconnaissance over the remaining unexplored regions of Alaska. Reference is made in the report to a recent exploration by prospectors of the unknown region lying north of Cook's Inlet, which shows that the Sushitna river comes from a long distance inland, one branch having been followed to a large lake 350 miles from the sea.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Movement of Sand and Shingle on Coasts.—"The propositions which Mr. Wheeler desires to establish are—(1) that the vast deposits of sand and shingle in bays and sheltered places on the coasts are due to causes which occurred in remote ages, and which are no longer in operation; (2) that the drift which travels along a coast is due to the erosion of the cliffs, and is derived from the wasting of the land, and not from the sea-bed; (3) that the quantity of drift is limited, so that it may be entirely stopped or its movement controlled; (4) that, while wind and waves are the agents which operate in eroding the cliffs and producing the drift, the regular and continuous travel of the material along the coast is due to the wave-action of the flood-tide; (5) that the regular and continuous movement of sand and shingle along a coast takes place only in the zone lying between low and high water mark; (6) that the contour of the sea-bed on a sandy coast, when covered with a moderate depth of water, remains in a stable condition, and that as long as the conditions remain the same, the form of the banks and the depth of the channels are not altered by the winds and waves; (7) that channels can be effectively deepened and maintained on sandy coasts by dredging; and, if properly directed, they will remain stable and retain their depth; (8) that harbours may be projected out from sandy coasts without danger of the entrances shoaling, provided that the piers are so placed as to derange the main set of the tidal current as little as possible, and are carried into a sufficient depth of water, and that, where required, the supply of littoral drift is cut off by protective works along the coast. *Discussion and Correspondence.*—With respect to the third proposition, Sir G. Nares contended, in the discussion, that the wave-action caused by alongshore winds was the chief agent in the transport of shingle and sand as low down as wave-action extended. Admiral Wharton contended that proposition (1) could not be maintained, and cited the changes which take place in Yarmouth Roads. Mr. Wolfe Barry agreed with Sir G. Nares as to drifting action, and, while

"Littoral Drift: in its relation to the Outfalls of Rivers, and to the Construction and Maintenance of Harbours on Sandy Coasts." By Wm. H. Wheeler, M. Inst. C.E. *Min. Proc. Inst. C.E.*, vol. CCXY. (March, 1896), pp. 2-32; Discussion on the above, pp. 33-56; Correspondence, pp. 56-87.

concurring in the author's view that the drift of shingle, etc., may be checked by engineering works, demurred to the statement that it can in all cases be stopped. Mr. L. F. Vernon-Harcourt points out (in the correspondence) that the flood-tide comes from the direction of the ocean, which is also the quarter most exposed to strong winds and heavy waves. The majority of the engineers who took part in the discussion and correspondence dissent from the author's statement that the flood-tide is the predominating influence in littoral drift, which they ascribe to winds and waves. The opinions expressed are, on the whole, adverse to the author's proposition (1), but on the other points are more equally divided.

Earth-Crust Movements and their Causes.—In his annual address to the Geological Society of America, the President, Joseph Le Conte, treats of the above subject in some detail.* His conclusions are summed up as follows: There are two primary and permanent kinds of crust-movements, namely, (a) those which give rise to those greatest inequalities of the Earth's surface—oceanic basins and continental surfaces; and (b) those which by interior contraction determine mountains of folded structure. These two are wholly determined by interior forces affecting the Earth as a whole, the one by unequal radial contraction, the other by unequal concentric contraction—that is, contraction of the interior more than the exterior. There are also two secondary kinds of movement, which modify the effects of the other two. These are: (c) those oscillatory movements, often affecting large areas, which have been the commonest and most conspicuous of all movements in every geological period, and are, indeed, the only ones distinctly observable and measurable at the present time, but for which no adequate cause has been assigned and no tenable theory proposed; and (d) isostatic movements or gravitative readjustments, by transfer of load from place to place, by erosion and sedimentation, or else loading and unloading by ice accumulation and removal, and also by readjustment of great crust blocks. If the previous one (c) or oscillatory movements have marked and so obscured the effects of (a) continent and ocean basin-making, this last (d), isostasy, has concealed the effects and obscured the interpretation of all the others, but especially of (b) mountain-making forces and the forces of oscillatory movements. In the minds of some recent writers, it has almost monopolized the whole field of crust-movements.

The Gases dissolved in Sea-water.—Dr. K. Rindam having recently thrown some doubt on the methods of analyzing the dissolved gases in sea-water introduced by Prof. Pettersson, Dr. Martin Knudsen, chemist to the Danish expedition on the cruiser *Lugolf* in Iceland and Greenland waters, has made some experiments with a method not open to the supposed disadvantage of requiring the storage of samples in glass bulbs for a longer or shorter period till the return home of the vessel. In an account of these experiments published in the *Comptes Rendus*, Dr. Knudsen does not state any definite opinion as to the objections brought forward by Dr. Rindam, but he describes some further investigations, made in conjunction with M. Ostenfeld-Hansen, on the action of plankton. Samples into which large numbers of copepods were introduced soon had the dissolved oxygen reduced by half, with increase of carbonic acid, while samples to which diatoms were added had their oxygen trebled and carbonic acid reduced by one-fourth after three hours' exposure to light. It is difficult to see how these results, important as they are, affect any recent work involving gas analyses as a help in tracing the movements of bodies of water. Prof. Pettersson, to whom all such work is due, concerns himself with oxygen and carbonic acid only when dealing with biological questions, and bases any conclusions as to downward currents and the like entirely

* *Science*, February 26, 1897.

on the quantities of nitrogen. In accounting for the presence of quantities of oxygen greater than the sea-water could take up in solution, Dr. Kundsén seems to increase one's confidence in Pettersén's nitrogen results.

Ice-caves.—The March number of the *Journal of the Franklin Institute*, Philadelphia, contains a paper by Mr. Edwin Swift Balch, in which he discusses the subject of ice-caves, and the causes of subterranean ice. The term "ice-cave," in the author's opinion, should especially apply to the hollows in the ice at the lower end of glaciers, whence the glacier waters make their exit. Ice-caves differ greatly from ice-gullies, the former having a roof, which means that the ice is formed directly in the cave itself, and is not—except, perhaps, near the entrance—solidified snow, but genuine subterranean ice. They may be divided into three main kinds: (1) Those at or near the base of cliffs, entering directly into the mountain with a down slope. This class is found in limestone and in volcanic rocks. Examples: the Kolehatchühle, Dobson, Roth in the Eifel. (2) Those at or near the base of cliffs, where a long passage-way exists before the ice-cave proper is reached. This class is apparently found in limestone rock. Examples: Hemenyßilva, the Frauenmauer. (3) Those where a large pit opens into the ground, and the ice-cave is found at the bottom opening into the pit. These are in limestone. Examples: Chaux-les-Passavant and La Genollière. Ice-caves proper are found in various parts of Europe, Asia, and America, mostly in the smaller ranges or in the outliers of the snowy ranges, and notably in the Jura, Switzerland, the Italian Alps, the Eastern Alps, in Tyrol, Steiermark, and Carinthia. There are some in Hungary, Russia, one in Iceland, one on the peak of Teneriffe, several in Siberia, one in Kondooz in Central Asia, one in Japan, and one in Korea. In treating of the subject of the cause of formation of the ice in caves, the author is of opinion that the cold air of winter is the chief factor, which reforms snow each year the ice which has been destroyed by the heat of the preceding summer.

GENERAL.

The Livingstone College.—The report of the Livingstone College for 1895-96, with a copy of which we have been favoured, shows that the institution is likely to supply a felt need by providing intending missionaries with instruction in the rules of health and special dangers of tropical climates, equally necessary for the sake of their own well-being as for the relief of the natives among whom they intend to work. The college has lately been extended so as to accommodate sixteen resident students. It is a work which would have had the cordial sympathy of the great explorer whose name it bears, and it may be hoped that it will do much to reduce the proportion of failure of health in the tropics from purely preventable causes.

OBITUARY.

J. Theodore Bent, F.S.A.

It is with much regret that we record the premature death of Mr. J. Theodore Bent, well known to the geographical world for his archeological explorations in various parts of Africa and South-West Asia. Mr. Bent had but recently returned from his last expedition to Sokatra and Southern Arabia, on which he had suffered severely from malarial fever. A chill caught on the way home brought about a relapse, and, pneumonia setting in, he succumbed after a short illness on May 5, at the early age of forty-five years.

The deceased traveller was the only son of the late James Bent, of Baildon House, near Leeds. His school-days were spent first at Malvern Wells, and afterwards at Repton, whence he proceeded to Wadham College, Oxford. After studying for the Modern History School, he graduated with honours in 1875. In 1877 he married Mabel, daughter of the late Robert Westley Hall-Dare, M.P., of county Wexford and Essex, who subsequently became his companion on all his exploring journeys. To escape the rigours of the English winter, Mr. and Mrs. Bent annually left their house in Great Cumberland Place to proceed to a more genial climate, and in this way they soon became thoroughly acquainted with many of the countries of South Europe. Mr. Bent had a remarkable facility for acquiring languages, and he was a fluent speaker both in Italian and modern Greek. In 1885 he embodied the results of his journeys in the Archipelago in a volume entitled 'The Cyclades: or, Life among the Insular Greeks.' His taste for archaeological research led him, from 1889 onwards, to choose for his scene of action such districts as by their antiquarian remains presented problems relating to the history of the ancient nations or races of the East. In that year he visited the Bahrein islands, in the Persian Gulf, the result of his investigations being to show the great probability that the group was a primitive site of the Phœnician race. After a visit to Cilicia Trachets in 1890, he, during the following winter, set himself to solve one of the most interesting questions connected with the ancient history of Eastern Africa and South-West Asia, viz. the origin of the ancient remains which had been discovered at Zimbabwe, in Mashonaland. A careful exploration of the ruins led him to conclude them to be the work of pre-Mohammedan inhabitants of Southern Arabia, who are known to have been an enterprising commercial people in very ancient times. Mr. Bent described the results of this journey in a book called 'The Ruined Cities of Mashonaland' (1892).

At the end of 1892, Mr. and Mrs. Bent again set out for Africa, this time to investigate the extensive ruins in the north of Abyssinia. This journey threw much new light on the early connection between the people of Abyssinia and those of South-West Arabia, whence both the writing and language of the old Abyssinians must have been derived. It is described in Mr. Bent's volume, 'The sacred city of the Ethiopians.' In the winter of 1893-94, Southern Arabia, the mother-country of both the peoples whose antiquities had been examined in the two preceding years, was visited, and a considerable addition made to our knowledge of the little-known Hadramut country. This was revisited during the succeeding winter, whilst that of 1895-96 was devoted to exploration on the African coast of the Red Sea. The last fatal journey is said to have resulted in the discovery of fresh archaeological matter in Sokatra and Southern Arabia, in the latter of which some new ground was broken.

Mr. Bent's kindly and genial nature had endeared him to a wide circle of friends, by whom his loss will be keenly felt. To our Society, of which he became a Fellow and Member of Council in 1890, he always readily communicated the results of his journeys, and both the *Proceedings* and *Journal* bear witness to the wide range of his travels. Besides the works mentioned above, and various magazine articles, Mr. Bent in 1893 edited a volume on 'Early Travels in the Levant' for the Hakluyt Society.

Sir William C. F. Robinson, G.C.M.G.

The late Governor of Western Australia, who died at his residence in London on May 2, aged sixty-two years, had been a Fellow of our Society since 1870. Fourth son of the late Admiral Hercules Robinson, he entered the colonial service in 1853 as private secretary to his brother, the present Lord Rosmead, then Governor of

St. Kitts, in the West Indies. He subsequently held various important colonial appointments both in the East and West, and had twice been Governor of West Australia previous to his last tenure of the office in 1860-65.

Louis Pascal Casella, F.R.A.S., F.R.Met.S.

One of the older members of the Society has passed away in the person of Mr. Louis Casella, the well-known scientific instrument maker, who had joined its ranks in 1868. Although of Italian extraction, Mr. Casella was born in Scotland, but came to London at an early age, making it his home for the rest of his life. By his many improvements and inventions in scientific instruments, he had materially assisted the labours of more than one generation of travellers and explorers, his adaptation of the pressure-gauge to the verification of temperatures taken at great oceanic depths being perhaps one of the most important. During his long life, Mr. Casella was always ready to lend a helping hand to those who asked his assistance, and he enjoyed the deserved respect of all with whom he came in contact. He died at Highgate on April 23, aged eighty-six years.

CORRESPONDENCE.

Sand-dunes.

Loralai, Baluchistan, March 25, 1897.

NOTICING the reference, at the conclusion of Mr. Corrieh's lecture on sand-dunes, to "musical" or "sound-giving" sandhills (*Journal* for March, 1897, pp. 107, 108), it came into my mind that when in October, 1884, Colonel (now Sir West) Ridgeway's mission was marching northward from the Helmand towards Herat, we had passed and seen in the distance one of these "vocal sand" phenomena, and that I had said something about it in my 'Travels with the Afghan Boundary Commission.' I find my account of it (blended with a description of the Mohatamedan superstitions regarding it) on pp. 112, 113 thus: "This great sand-drift, lying between two ribs on the south side of the Kuh-i-Kalah-i-Kah, and reaching more than halfway to its summit, is visible for miles around, and is a miracle in itself," etc. It was pointed out to me by the guide from a distance of 10 or 12 miles. The Goldsmid-Pollock Mission of 1872 must have visited this vocal sand-drift, as both Bellow and Ennan Smith appear to describe it in their books. (I have not their books here at present for reference.) Captain MacMahon's description of mountain ranges with "sand banked up against their sides as high as 1000 to 2000 feet above the level of their base," depicts accurately the appearance of the vocal sand-drift of Imam Zaid. The range known locally as "Kuh-i-Kalah-i-Kah" lies some 30 miles north or north by west of Lash-Juwain in Sistan. In the midst of the Baluch desert between Nushki and the Helmand we saw one or more mountain ranges with the sand banked high up against their rugged rocky sides and wedged into the ravines. What struck me most was that the banking up was on the south side, while the prevailing wind was, to the best of my knowledge, from the north.

My first acquaintance with the power of sand was in the Afghan war of 1880, when I skirted in several places the eastern edge of the great Registan, which extends eastward from the Helmand to within a few miles of Kandahar, and within easy sight of the Khojak Tunnel. I just recall a great wall of sand (50 or 100 feet high?) battered by the Dori river. When I next saw it was in October, 1884, on

its southern side. At Umar Shah (38 miles west of Nushki) it was burying a row of tall willow trees, just as Mr. Corriish describes the sand burying date palms in Egypt. There is nothing of the sand-dune about the Registan. That is a great sea of sand, in which, on a clear day, hills—and high hills, too—stand up as islands. It moves slowly eastward and south-eastward, as I gathered. Westward of the Helmand, too, there extends for 100 miles or more a great sand desert. When camped at Kalah-i-bat, we heard of an ancient buried city where after rain the natives unearthed many coins. It was suggested that this city might be Pasargade. This great Registan, east and west of the reach of the Helmand from Kalah-i-bat to Rudhar, is still food for the explorer, when the Amir of Afghanistan withdraws his embargo on European travellers. In and around it much may be learnt, including a good deal about sand-dunes. Registan, I may add, means "land of sand," or "great tract of sand."

A. O. YATE, Major,
2nd Baluchis.

Proposed New Terms in Geographical Distribution.

Animals are not, in most cases, generally distributed over the Earth's surface, but are confined to certain definite localities, which are called their "specific areas." Thus Africa south of the Atlas is the specific area of the giraffe and of the African elephant; they are found here and nowhere else. In the same way the sloths and anteaters are confined to tropical America, and the polar bear to the North Polar lands. Such animals may be called "*topo-politan*" (*révot*, *locus*, and *rex*, *ciuitas*) in contradistinction to those that are universally distributed, or "*cosmo-politan*." As regards species, cosmopolitan animals are rare, but when we come to the higher groups, such as genera, families, and orders, there are many forms that may be called "*cosmopolitan*," or, at any rate, "*quasi-cosmopolitan*." The dog-genus (*Canis*) is a good example of quasi-cosmopolitan genus of mammals. Dogs of various species occur in almost all lands, from the poles to the equator—even in Australia, where the mammals are generally so peculiar, although dogs are absent in Madagascar and in the Pacific Islands. In the class of birds, some species are almost cosmopolitan, such as the sanderling (*Calidris acuminata*) and the osprey (*Pandion haliaetus*), but by far the greater number of birds are "*topo-politan*," and in many cases are confined within very narrow limits.

The vast majority of natural groups of animals being "*topo-politan*," i.e. restricted to more or less definite areas on the Earth's surface, it follows that these various areas are characterized by the presence of certain forms of animal life which do not occur elsewhere. These forms it is proposed to call "*Topomorphs*." Thus the giraffe is a "*topomorph*" * of the Ethiopian region (Africa south of the Atlas); the sloths and anteaters are topomorphs of the neotropical region (South and Central America); the duck-bill and lyre-bird are topomorphs of Australia; and the kiwi (*Apteryx*) of New Zealand. On the other hand, in many cases the absence of certain forms of animal life in countries where they might be naturally expected to occur is a marked feature of certain parts of the world's surface. For example, bears (*Ursus*) and deer (*Cervus*) are altogether absent from the Ethiopian regions, and cats (*Felis*) from Australia, though these forms are widely distributed over other lands. It is proposed to designate such forms as "*lipomorphs*" † (*lóvot*,

* From *révot*, *locus*, and *morph*, *forma*.

† On a previous occasion (see P.Z.S., 1882, p. 211), I have proposed to use "*lipo-type*" in this sense instead of "*lipomorph*." But the latter term is better, because "*type*" and its combinations are generally used technically in zoology to indicate the particular specimen from which the original description or figure of a species has been taken.

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The vast majority of natural groups of animals being "topo-politan," i.e. restricted to more or less definite areas on the Earth's surface, it follows that these various areas are characterized by the presence of certain forms of animal life which do not occur elsewhere. These forms it is proposed to call "*Topomorphs*." Thus the giraffe is a "*topomorph*" * of the Ethiopian region (Africa south of the Atlas); the sloths and anteaters are topomorphs of the neotropical region (South and Central America); the duck-bill and lyre-bird are topomorphs of Australia; and the kiwi (*Apteryx*) of New Zealand. On the other hand, in many cases the absence of certain forms of animal life in countries where they might be naturally expected to occur is a marked feature of certain parts of the world's surface. For example, bears (*Ursus*) and deer (*Cervus*) are altogether absent from the Ethiopian regions, and cats (*Felis*) from Australia, though these forms are widely distributed over other lands. It is proposed to designate such forms as "*Hypomorphs*" † (*ὑπό*,

* From *τόπος*, locus, and *μορφή*, formæ.

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deficio, and *poppi*, *forma*) as regards the particular areas in which they are not found. Thus bears and deer are "lipomorphs" of Africa south of the Atlas, and cats (*Felis*) of Australia.

The three new terms which I propose to introduce into the study of the geographical distribution of animals are therefore—

1. "*Topopolitan*" to designate natural groups of limited geographical range (in contradistinction to "*cosmopolitan*").

2. "*Topomorph*" = a group of animals limited to a particular district and characteristic of it.

3. "*Lipomorph*" = a group which characterizes a particular district by its absence from it.

P. L. SCLATKE, F.R.S.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1896-1897.

Eleventh Ordinary Meeting, May 10, 1897.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

EXORDIUM.—Lieutenant R. A. E. Benn (*Indian Staff Corps*); George Rowland Blades; Stanley Victor Coote; Harney Cox; John Eugene Dawson, J.P.; Captain Henry Richmond Gale, R.E.; Ernest W. Greg; Douglas Mackie Hall; Walter Skilling Hill; Lieutenant Robert Richard Hubbard, R.N.R.; Captain E. Le Maurier; John Arthur Ludlow; G. B. Macpherson-Grant; George Jackson Poulton; Lieutenant Dudley G. Seagrims, R.A.; Daniel G. Stapleton; Henry Morris Upcher; Rev. William Vivian; Lieutenant F. O. Webb Ware (*Indian Staff Corps*).

The President said: Before proceeding to the business of the evening, I must allude to the loss we have sustained by the death of Mr. Theodore Bent. He generally, during the last few years, made interesting excursions into unknown parts of Arabia and Africa, and afterwards read us in this room most interesting papers; and, judging from the very large audience he always had, I am sure that these papers were fully appreciated. He was a very accomplished man, both as an archaeologist and as a geographer, a charming companion, and a true friend; perhaps it would not befit me to dwell upon some of his still higher qualities. You will remember that his wife, Mrs. Bent, always accompanied him in his journeys, and shared all his hardships and dangers. I am sure that all of us will feel the deepest sympathy for Mrs. Bent in her great bereavement.

The Paper read was:—

"Recent Journeys in Szechuan, Western China." By Mrs. Bishop.

Afternoon Technical Meeting, Wednesday, May 12, at 4.30 p.m.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

The Paper read was:—

"Variation and Dip of the Magnetic Needle." By Arthur W. Hershburg.

GEOGRAPHICAL LITERATURE OF THE MONTH.

*Additions to the Library.*By HUGH ROBERT MILL, D.Sc., *Librarian, R.G.S.*

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Académie, Akademie.	Mag. = Magazine.
Ann. = Annals, Annales, Annalen.	P. = Proceedings.
B. = Bulletin, Bollettino, Boletín.	R. = Royal.
Com. = Commerce, Commercial.	Rev. = Review, Revue, Revista.
C. Rd. = Comptes Rendus.	S. = Society, Société, Selakab.
Erdk. = Erdkunde.	Sitzb. = Sitzungsbericht.
G. = Geography, Geographie, Geografia.	T. = Transactions.
Ges. = Gesellschaft.	V. = Verein.
I. = Institute, Institution.	Verh. = Verhandlungen.
J. = Journal.	W. = Wissenschaft, and compounds.
M. = Mittheilungen.	Z. = Zeitschrift.

On account of the ambiguity of the words octavo, quarto, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 x 6½.

EUROPE.

- Alps.** *Rec. (Z. 40 (1897): 6-10.* **Garnier.**
Note sur la répartition des langues dans les Alpes occidentales. Par Christian Garnier. *With Map.*
 The map shows the distribution of languages in the western Alps, distinguishing Italian, French, and German (the two latter in three degrees of prevalence), and the old Lignrian patois.
- Alps—Adamello District.** *Stsch. Preuss. A.W. Berlin (1896): 1033-1048.* **Salomon.**
Geologisch-petrographische Studien im Adamello-gebiet. Von Dr. Wilhelm Salomon.
- Alps—Mont d'Ambin.** **Coolidge.**
W. A. B. Coolidge. Le Massif d'Ambin. Lyon: Imp. Mougin-Rusand, 1897.
Size 10 x 6½, pp. 32. Frontispiece and Sketch-map. Presented by the Author.
 A detailed account of the mountain region which lies between the tunnel of Frejus (usually wrongly called the Mont Cenis tunnel) and Mont Cenis itself. This district, Mr. Coolidge states, has hitherto been somewhat neglected by alpinists.
- Alps—Valleys.** *C. Rd. 124 (1897): 783-787.* **Lugeon.**
La loi de formation des vallées transversales des Alpes occidentales. Note de M. Maurice Lugeon.
 The author explains the geographical position of the transverse valleys of the Alps by the observation that these valleys occupy synclinals in a series of crust-folds, which runs transversely to the main lines of folding, to which the chain itself is due.
- Austria—Bukovina.** *B.S.G. Roman 15, 1894 (1896): 2-19.* **Olinescu.**
Hărțile Bucovinei, memoriu de Dionisie Olinescu.
 On the maps of Bukovina.
- Austria—Dachstein.** *M.G. Ges. Wien 40 (1897): 23-58.* **Grollier v. Mildensee.**
Das Karlsfeld. Von M. Grollier v. Mildensee. With Map.
 Detailed account of the survey of an alpine ice-field.
- Austria—Istria.** *B.S.G. Roman 15, 1894 (1896): 56-77.* **Burada.**
Românii din Istria, conferință de T. T. Burada.
 On the Rumanian element in Istria.
- Austria—Istria.** *Mém. A. Dijon (4) 5, 1895-96 (1896): 145-163.* **Robin.**
Cinq jours de croisière en Istrie. Par le Dr. Albert Robin. With Illustrations.
 Account of a cruise in the Adriatic on board Mr. Gordon Bennett's yacht.

- Austria—Salzburg.** Ebner.
Das Hauptzerthal mit den Denkmälern seiner Geschichte und Kultur. Von P. A. Ebner.—Fünfter Jahres-Bericht des Souvlik-Vereins für das Jahr 1896. Pp. 11-22. Wien, 1897. Size $11\frac{1}{2} \times 7\frac{1}{4}$. *Illustrations.*
- Austria—Sudetes.** *Abtégé B. S. Hongrois G.* 24 (1896): 42-44. Francé.
Das Quellgebiet der March. Von Raoul H. Francé.
On the central region of the Sudetic range, in which the river March takes its rise.
- Austria—Tyrol.** *Aus allen Weltteilen* 28 (1897): 365-372. Schultheiss.
Das Deutschtum in Südtirol. Von Dr. Fr. Guotram Schultheiss.
A regretful statement that Germanizing influences are not active in South Tyrol, where the Italian language and Italian sympathies continue amongst the mass of the people.
- France.** *B. S. G. Commerce. Bordeaux* 20 (1897): 161-174. Durège.
Dunes primitives et forêts antiques de la côte de Gascogne. Par E. Durège.
With Map.
The object of this paper is to show that at the commencement of the contemporary geological period the coast between the Gironde and the Adour was occupied by moving sand-dunes, which, since the commencement of the historic period, have been fixed by the growth of forests.
- France—Dijon.** *Mém. A. Dijon* (4) 5 (1893-96) (1896): 185-229. Picard.
Le commerce du bois de chauffage et du charbon de bois à Dijon au XVIII^e siècle.
Par M. E. Picard.
- France—Normandy.** *Rev. G.* 40 (1897): 161-172. Filon.
Le Cap Antifer et la carte d'état-major. Par J. Filon. *With Maps.*
The Staff map and the official French chart differ in the point to which the name "Cap Antifer" is assigned. The author discusses these differences, urges the importance of a combined map and chart to do justice to the delineation of the coast, and gives a short account of the district near Cape Antifer, in Normandy.
- Germany—Houses.** *Globus* 71 (1897): 169-176, 183-188, 206-214. Rhamm.
Der heutige Stand der deutschen Hausforschung und das neueste Werk Meitzens.
Von Karl Rhamm.
The scientific study of domestic architecture is carried out very fully in Germany, and this series of papers summarizes the great work of Meitzens on the subject, with references to the plan of dwelling-houses in other countries.
- Germany—Pomerania.** *Aus Allen Weltteilen* 28 (1897): 343-349, 379-388. Tetzner.
In der Kasehubei. Von Dr. P. Tetzner.
Notes of the survivors, now not exceeding two hundred, of the ancient Kasehbi people who live on the south bank of the Loba lake in Pomerania.
- Greece.** *Förhand. Vidensk.-Selsk. Christiania* (1895) (1896): 1-48. Schjøtt.
De ethnographiske forhold i det forhistoriske Grækenland. Af P. O. Schjøtt.
On the ethnographic conditions of prehistoric Greece.
- Greece.** *G. Z.* 3 (1897): 185-225. Philippson.
Griechenland und seine Stellung im Orient. Von Dr. Alfred Philippson. *With Map.*
No one is better qualified than Dr. Philippson to describe the physical features of Greece, as he does briefly in this article which also discusses the Greek frontier, the character and economic position of the Greeks, a glance over Greek history, an account of the present state of the country and of the Greeks living in neighbouring countries.
- Hungary—Cartography.** *Abtégé B. S. Hongrois G.* 24 (1896): 82-97. Márki.
Die ungarische Kartographie von einst und jetzt. Von Dr. Alexander Márki.
The first attempts to survey parts of Hungary geographically are traced back to A.D. 89 under the Emperor Domitian.
- Hungary—Fiume.** *L'Univers* 7 (1897): 83-87, 106-108. Annoni.
Fiume—enot d'aujourd'hui. Di Antonio Annoni. *With Illustrations.*

Hungary—Lake Balaton.

Cholnoky.

Résultats der wissenschaftlichen Erforschung des Plattensees. Herausgegeben von der Plattensee-Commission der Ung. Geographischen Gesellschaft. Erster Band. Physikalische Geographie des Plattensees und seiner Umgebung. Dritter Teil. Limnologie des Plattensees. Von Eugen v. Cholnoky. Wien: E. Hölzel, 1897. Size 11½ x 8½, pp. 120. *Plate and Illustrations.*

This will be referred to elsewhere.

Hungary—Lake Balaton. *Abregé R.S. Hongroise G.* 24 (1896): 76-82.

Léczy.

Bericht über die wissenschaftliche Erforschung des Balatonsees. Von Ludwig von Léczy.

A short account of the work of the Lake Balaton Committee.

Iceland.

Thoroddsen.

Th. Thoroddsen. Geschichte der Isländischen Geographie. Antiquarische Uebersetzung von August Geblinck. Erster Band: Die Isländische Geographie bis zum Schlusse des 10. Jahrhunderts. Leipzig: B. G. Teubner, 1897. Size 10 x 7, pp. xvi. and 238.

A very careful translation from Thoroddsen's important Icelandic work on the history of Iceland.

Italy.*Atti R. A. Linea* (1897) (5) *Rendicanti* 6, 190-201.

Taccchini.

Sull' insolazione al nord, al centro ed al sud d'Italia. Nota del Socio P. Taccchini.

On insolation in Italy. A table is given of the average insolation for each ten-day period for Turin, Padua, Aquila, Rome, Lecce, and Palermo.

Italy—Lago d'Orta.

Agostini.

G. de Agostini. Il lago d'Orta. Torino: C. Clausen, 1897. Size 13 x 9½, pp. 40.

Maps and Profiles. Presented by the Author.

A special note will be devoted to this fine piece of work.

Italy—Sicily.*C. Rd.* 134 (1897): 797-800.

Faye.

Sur l'observatoire de l'Etna, d'après les observations de M. Riech. Note de M. H. Faye.

The observatory on Mount Etna was established in 1891 for astronomical and meteorological observations, at an elevation of 9850 feet above the sea. The mean annual temperature was about 33° Fahr.; for summer, 45°; and for winter, 20°.

Mediterranean—Crete.*Fortnightly Rev.* 61 (1897): 782-810.

Dillon.

Crete and the Cretans. By Dr. E. J. Dillon.

Mediterranean—Crete.*Ausgaben Weltkarten* 24 (1897): 373-380.

Canstatt.

Kreta. Von Kometendirektor O. Canstatt. *With Map and Illustration.*

Mediterranean—Malta.

Mizzi.

A Voice from Malta. By M. A. M. Mizzi. 1896. Malta: printed at the Daily Malta Chronicle Office. Size 7 x 5, pp. xii and 60. Price 1s. 6d. *Presented by the Author.*

Discusses chiefly the language of Malta, with notes on the islands and a bibliography.

Norway.

Norway Pilot. Part 1. From the Narve to Christiania; thence to the Kattegat. Third Edition. London: J. D. Potter, 1897. Size 9½ x 6, pp. xxv. and 492. *Index Chart.* Price 4s. *Presented by the Hydrographer of the Admiralty.*

Norway—Earthquakes.*Förhandl. Vidensk. S. Christiania* 1895 (1896): 1-78.

Reusch.

Jordskjælv i Norge. Tre afhandlinger. Af Hans Reusch. Med "An English Summary of the Contents."

Norway—Fisheries.*Skrifter Vidensk. Christiania*, 1895 (1896): 1-76, 1-78.

Hjort.

Hydrographic-biological Studies of the Norwegian Fisheries. By Dr. Johan Hjort. *With 15 Plates and Charts.* Tables of the Hydrographical Investigations.

This will be noticed in the Monthly Record.

Norway—Kongsberg.*Skrifter Vidensk. Christiania*, 1894 (1895): 1-104.

Münster.

Kongsbergs ortsdistrikt. 1. Grubefeltets geologi. 2. Fahlbaud og fahler. 3. Gangformatiønnerna. 4. Krefaringer om sølvets opptækt. 5. Kalkspatgangene og sølvets genneist. Af Chr. A. Münster.

On the Kongsberg Ore district, in the south of Norway.

- Norway—Lofoten.** *Globus* 71 (1897): 201-204. **Blomberg**
 Beim Kabeljaufang auf den Lofoten. Von H. Blomberg. *With Illustrations.*
 On the cod-baeries of Northern Norway.
- Norway—Stavanger.** *Skrifter Vidensk. Christiania*, 1895 (1896): 1-72. **Arbo**
 Fortsatte Bidrag til Nordmandenes Anthropologi. III. Stavanger Amt. Af
 C. O. E. Arbo. *With Diagrams.*
- Russia.** *Contemporary Rev.* 71 (1897): 711-733. **Durban**
 Russia as it is. By W. Durban.
 The position of Russia as a modern nation, with regard to its people, culture, and
 political position.
- Russia.** **Krichtsavoritch.**
 Annuaire Géologique et Minéralogique de la Russie, rédigé par N. Krichtsavoritch.
 Vol. 4. livr. 2 (première moitié). Varsovie, 1897. Size 12½ x 9.
- Russia.** *Imp. and Asiatic Quarterly Rev.* 3 (1897): 291-308. **Parker**
 Modern Russia and Asiatic Traditions. By R. H. Parker.
- Russia—Baltic Coast.** *Fennia* 12 (1896): 1-16. **Boudanoff**
 Die meculare Helung der Küste bei Riga, Lithau und Ost-Drinsk (Dänismünde).
 Von Axel Boudanoff.
- Russia—Finland.** *Fennia* 12 (1896): 1-17. **Herlin**
 Tavastmaerosionsterrasser och strandlinjer. Af Rafael Herlin. *With Map*
and Plate. [With Abstract. Erosionsterrasser und Strandlinien am See
 Tavastmaen.]
- Russia—Finland.** *Fennia* 12 (1896): 1-43. **Kihlman**
 Nattfrostarna i Finland 1894. Af A. O. Kihlman. *With Maps.*
 On the night-frosts in Finland during 1894, with an abstract in German.
- Russia—Finland.** *Fennia* 12 (1896): 1-44. **Ramsay, etc.**
 Till frågan om det senglaciala halvets utbredning i södra Finland. Af Wilhelm
 Ramsay. *With Map.*
 Bihang 1. Marina gränsar i östra Finland, bestående af V. Backman.
 Bihang 2. Nagra iakttagelser rörande Yohlahafvets högsta strandlinser. Af
 J. J. Sederholm.
 Bihang 3. Résumé: La transgression de l'ancien mer glaciaire (la mer de
 Yohla) sur la Finlande méridionale.
- Russia—Finland.** *Fennia* 12 (1896): 1-32. **Sederholm**
 Några not om södra Finlands prekvartära geologi. Svar till Professor F. J. Wijk.
 Af J. J. Sederholm. [With Abstract. Einige Worte über die präquartäre
 Geologie des südlichen Finnlands. Antwort an Herrn Professor F. J. Wijk.]
- Russia—Finland.** *Fennia* 12 (1896): 1-22. **Wahlroos**
 Bidrag till kännedom om hafstrandens flerskjutning vid en del af Finlands
 västkost. Af Achilles Wahlroos. *With Map.* [With Abstract. Verschiebung
 der Strandlinie an der Westküste Finnlands.]
- Russia—Finland.** *Fennia* 12 (1896): 1-30. **Wijk**
 Om södra Finlands primitiva formationer [With Abstract. Über die primitiven
 Formationen Süd-Finnlands. Von F. J. Wijk.]
- Russia—Geology.** **Nikitin**
 Bibliothèque Géologique de la Russie. 1895. Composée sous la rédaction de S.
 Nikitin. Supplément au T. xv. des Bulletins du Comité Géologique. St. Peters-
 burg: Eggers & Co., 1896. Size 10 x 7, pp. 224. *Presented by the Geological*
Committee of the Imperial Russian Geographical Society.
- Sweden.** *Isis* 17 (1897): 41-70. **Andersson**
 Den Centraljämteska isen. Af Gunnar Andersson. *With Maps and Illustrations.*
 On the glacial lake, and the glacial geology, of Central Jämtland, in Sweden, with
 three maps showing the successive positions of the ice-cap.
- Switzerland.**
 Statistique de la Suisse—197. Livraison. Résultats de la Statistique Suisse des
 Incendies du 1^{er} janvier 1893 au 31 décembre 1894. Publié par le Bureau de
 Statistique du Département fédéral de l'intérieur. Berne, 1896. Size 11 x 9, pp.
 36 and 72.

Switzerland.**Graf.**

Bibliographie der Schweizerischen Landeskunde. Fascikel III. Generalregister. Ergänzungen und Nachträge zu den Fascikeln II. a—c, enthaltend Landesvermessung, Kataloge der Kartensammlungen, Karten, Pläne, Reliefs und Panoramen, Herausgegeben vom Eidgenössischen Topographischen Bureau. Redigirt von Professor Dr. J. H. Graf. Bern: K. J. Wyss, 1890. Size 9 x 6, pp. [220] and xvi.

Switzerland—Statistics.

Atlas graphique et statistique de la Suisse. Publié par le Bureau de Statistique du Département Fédéral de l'Intérieur. 1897. Bern: Stämpfli & Cie. Size 10 x 7, pp. xvi. and 96. *Maps and Plates.*

All the statistics of Switzerland are here presented in a graphic form, assisted by the skillful use of colour. They are given as maps, curves, and diagrams, according to the special appropriateness for each case.

Switzerland—Statistics.

Annuaire Statistique de la Suisse. Publié par le Bureau de Statistique du Département Fédéral de l'Intérieur. Sixième Année. 1896. Bern, 1897. Size 9½ x 6½, pp. 328.

Switzerland—Valais. *M. Antiquar. Ges. Zürich* 24 (1896): 97-180. **Heierli and Oechsl.** Urgeschichte des Wallis. Von J. Heierli und W. Oechsl. *With Map and Plates.*

An elaborate discussion of the pre-history of Valais, derived from antiquities, and treated under the heads of the Stone, Bronze, and Iron ages, with later references to the earliest historical accounts.

United Kingdom.**Gelkie.**

The Ancient Volcanoes of Great Britain. By Sir Archibald Gelkie, F.R.S. 2 vols. London: Macmillan & Co., 1897. Size 10½ x 7, pp. (vol. i.) xxiv, and 478; (vol. ii.) xvi, and 492. *Maps and Illustrations.* Price 36s. *Presented by the Publishers.*

A detailed notice of this important work will be given in the Monthly Record.

United Kingdom.

Rep. British Assoc. (1896): 357-365.

Watts.

Photographs of Geological Interest in the United Kingdom. Seventh Report of the Committee. Drawn up by Mr. W. W. Watts.

The collection of geological photographs now numbers 1412, and is being arranged in the Geological Museum in Jermyn Street. It is a matter of no small importance to secure good specimens of geological sections and structures which are often exposed only for a short time.

United Kingdom—England and Wales. *J. R. Statistical S.* 60 (1897): 33-83. **Walton.**

Local Death-Rates in England and Wales in the Ten Years 1881-90. By Thomas A. Walton. *With Diagrams.*

United Kingdom—England—Mersey. *Rep. British Assoc.* (1896): 548-568. **Lyster.**

On the Physical and Engineering Features of the River Mersey and Port of Liverpool. By George Feabery Lyster.

United Kingdom—England—Winchester.

Maxwell.

Hucknall's Map. 161 (1897): 483-499.

A City of many Waters. By Sir Herbert Maxwell, M.R.

A picturesque description of Winchester and the river Itchin, including an outline of the history and antiquities of the town.

United Kingdom—Ethnographical Survey.

Brubrook.

Rep. British Assoc. (1896): 607-656.

Ethnographical Survey of the United Kingdom—Fourth Report of the Committee.

Drawn up by Mr. E. W. Brubrook.

This report contains four papers—the Ethnographical Survey of Ireland, by the committee; the Ethnographical Survey of Pembroke, by Mr. E. Laws; Preliminary Report on Folklore in Galloway, by Dr. W. Gregor; and on the method of determining the value of Folklore as ethnological data, by Mr. G. L. Gomme.

ASIA.

Arabia—Petra.

T. Liverpool G.S. (1896): 63-74.

Hill.

A Journey to Petra—1896. By Gray Hill.

- Asia-Minor.** *Le Globe* 36, 1896-1897 (1897): 31-43. **Martin.**
 Souvenirs de quelques années passées en Asie Mineure. Par M. William Martin.
 The descriptions here given of peoples, towns, and public works in Asia-Minor are the result of eight years' observation, while the author was assisting as an engineer in the construction of the Anatolian railway.
- Ceylon.** *Scottish G. Mag.* 13 (1897): 163-188. **Clarence.**
 Ceylon. By L. B. Clarence.
- China.** *A travers le Monde, Tour du Monde* 3 (1897): 97-100.
 Mission Lyonnaise d'Exploration commerciale en Chine. Le Se-Tchouen—Souf-Fou—La Yang-Tsé—Kiating-Fou. With illustrations.
- China—Confucius.** *Imp. and Asiatic Quarterly Rev.* 3 (1897): 387-412. **Parker.**
 A plain account of the Life, Labours, and Doctrines of Confucius. By E. H. Parker. With Map, Specimen of Confucius' Handwriting, and Eight Pictures from a rare Chinese book (the latter supplied by Dr. Leitner).
- Chinese Empire—Tibet.** *T. Liverpool G.S.* (1896): 71-92. **Fletcher.**
 A Journey toward Lhasa. By W. A. L. Fletcher.
 Mr. Fletcher accompanied Mr. and Mrs. Littledale on their last journey across Tibet.
- Dutch East Indies—Historical.** **Bisschop.**
Dijkt, Taal, Land, en Volksh. Ned.-Indië (6) 3 (1897): 183-209.
 Onderzoek van stukken in het India office. Verslag van Mr. W. Roussigneau Bisschop.
 An account of the material in the India Office, London, bearing on the history of the Dutch in the East Indies.
- India—Anthropology.** **Thurston.**
 Madras Government Museum. Bulletin, vol. ii, No. 1. Anthropology. Badagas and Irulas of the Nilgiris; Paniyas of Malabar; A Oberman Skull; A Chinese-Famil Cross; Kuruba or Kurumba; Summary of Results. With Seventeen Plates. By Edga; Thurston, Madras, 1897. Size 9 x 5½, pp. 62. Presented by the Author.
- India—Baluchistan.** **Maynard and Prain.**
 Records of the Botanical Survey of India. Vol. i, No. 8. A Note on the Botany of the Baluch-Afghan Boundary Commission, 1896. By F. P. Maynard and D. Prain. Calcutta, 1896. Size 10 x 8½, pp. [14]. Map.
- India—Burma.** *Blackwood's Mag.* 161 (1897): 530-544. **Fielding.**
 How the Famine came to Burma. By H. Fielding.
 A description of the causes which led to the famine in Upper Burma last winter, and the way in which the scarcity was faced by the people.
- India—Forestry.** *Imp. and Asiatic Quarterly Rev.* (3) 3 (1897): 245-257. **Brandis.**
 Indian Forestry. The extended employment of Natives. By Sir Dietrich Brandis, M.S.E., etc.
- India—Madras.**
 Report on the Administration of the Madras Presidency, during the year 1895-96. Madras, 1896. Size 13½ x 8½, pp. xvi, 40, 216, and ccxviii. Diagrams. Presented by the Secretary of State for India.
- Indian Ocean.**
 Straits Settlements. Papers relating to the Cocos-Keeling and Christmas Islands. London: Eyre & Spottiswoode, 1897. Size 15½ x 8½, pp. iv, and 60. Map. Price 1s.
 A note on this Report will be given in the Monthly Record.
- Malay Archipelago—Sumatra.** **Van der Kemp.**
Dijkt, Taal, Land, en Volksh. Ned.-Indië (6) 3 (1897): 210-223.
 De Zendingen van Ibbetson en Anderson naar Sumatra's Oostkust in 1820 en 1823. Door P. H. van der Kemp.
 A description of the missions of Ibbetson and Anderson in Sumatra in 1820 on behalf of the East India Company, with long quotations from the English records in the India Office.

- Palestine.** *M.G. Ges. Wien* 40 (1897): 1-22. **Dienar.**
Die Katastrophe von Sodom und Gomorra in Lichte geologischer Forschung.
Von Dr. C. Dienar.
A discussion of the natural phenomena which may account for the scriptural description of the destruction of the cities of the plain.
- Siberia.** *Blackwell's Mag.* 181 (1897): 500-513, 653-667. **Simpson.**
The Prisons of Siberia. I. On the March. By J. Y. Simpson.
An account of a recent visit to the forwarding prisons of Siberia.
- Siberian Railway.** *Rev. Française* 22 (1897): 231-238. **Vasco.**
Le Transsibérien et le Transmandchourien. Par G. Vasco. With Map.
- Siberia—Railway.** *National G. Mag.* 3 (1897): 121-124. **Greely.**
The Siberian Transcontinental Railway. By General A. W. Greely.
Notes on the Trans-Siberian railway from information supplied by U.S. diplomatic and consular officers.
- Siberia—Sakhalin.** *Fortnightly Rev.* 61 (1897): 711-715. **De Windt.**
The Island of Sakhalin. By Harry de Windt.

AFRICA.

- British East Africa—Zanzibar.** **Baumann.**
Wissenschaftliche Veröffentlichungen des Vereins für Erdkunde zu Leipzig.
Dritter Band, Zweites Heft. Die Insel Sansibar. Von Dr. Oscar Baumann.
Leipzig: Ducker & Humblot, 1897. Size 10 x 64, pp. 48. Map and Plan.
This will be specially noticed.
- British South Africa.** *J.S. Arts* 45 (1897): 515-531. **Fripp.**
Recent Travels in Rhodesia and British Bechuanaland. By C. E. Fripp.
- British West Africa.** **Harford-Battersby.**
Imp. and Asiatic Quarterly Rev. (8) 3 (1897): 299-319.
Bila and Benin. By C. F. Harford-Battersby, M.A., M.D.
- Egypt.** *A travers le Monde, Tour du Monde* 3 (1897): 129-132. **Gayet.**
Une Visite à la Vallée du Bir-el-Ain Haute-Egypte. Par M. A. Gayet. With Illustrations.
- Egypt.** *Globe* 71 (1897): 233-246. **Goldschäfer.**
Aus dem mohammedanischen Heilgenkultus in Ägypten. Von Ignaz Goldschäfer.
- Egypt.** *Z. Ges. Ethn. Berlin* 22 (1897): 1-22. **Schweinfurth.**
Die Steinbrüche am Mons Claudianus in der östlichen Wüste Ägyptens. Von G. Schweinfurth. With Map and Plate.
- Egypt—Nile Delta.** *P.R.S.* 61 (1897): 32-40. **Judd.**
Second Report on a Series of Specimens of the Deposits of the Nile Delta, obtained by Boring Operations undertaken by the Royal Society. By John W. Judd, c.s., etc.
This will be the subject of a note.
- French West Africa—Niger.**
B. Comité d'Afrique Française 7 (1897): 107-112.
Les missions françaises dans la boucle du Niger: Dans le Mossi.—La mission Band.—La mission Brouttonot. With Map.
- Madagascar.** *P. Zoolog. S.* 1896 (1897): 971-981. **Major.**
On the General Results of a Zoological Expedition to Madagascar in 1894-96.
By C. J. Forsyth Major.
Dr. Forsyth Major reached Madagascar in August, 1894, and left in July, 1896. Most of the time was spent in the Tanaïs forest, staying at Ivohimanitra, Ambohimantombo, Antsoetra, Sirabé, Ampitambo. The time, save for interruptions due to the political condition of the country, was spent in the diligent collection of zoological specimens. An extended series of excavations in the marabes of Sirabé brought to light a better collection of *Epyornis* remains than had previously been obtained.

- Sweden.** *M. V. Erdk. Leipzig, 1896 (1897): 1-79.* **Müller.**
Die Staatenbildungen des oberen Vello- und Zwischenessen-Gebietes. Ein Beitrag zur politischen Geographie. Von Dr. Phil. Curt Müller. *With Map.*
On the organization of the native nationalities in the upper Wello region and the region between the great African lakes.

- West Africa.** *T. Liverpool G. S. (1896): 34-52.* **Kingsley.**
The Ascent of Cameroons Peak, and Travels in French Congo. By Miss M. H. Kingsley.

- West Africa—Benin.** *T. Liverpool G. S. (1896): 94-101.* **Ogilby—Irvine.**
Description of the Kingdom of Benin, written about the year 1630, and abridged from the folio edition of John Ogilby, published in 1670. By James Irvine. *With Plate.*

- West Africa—Niger.** *Rev. Française 22 (1897): 208-218.*
Niger: Les Français à Boussa. *With Map.*

NORTH AMERICA.

- Canada.** *Nautical Mag. 86 (1897): 330-334.* **Gilbert.**
Canada's Proposed New Front Door. By Robert Jarvis Gilbert. *With Map.*
On the proposed Hudson bay route to Western Canada.

- Canada—Geology.** **Adams.**
Geological Survey of Canada, G. M. Dawson, C.M.G., etc., Director. Part J, Annual Report, vol. viii. Report on the Geology of a portion of the Laurentian Area lying to the north of the Island of Montreal. By Frank D. Adams, M.B. Ottawa, 1896. Size 10 x 7, pp. 184. *Map and Plates. Presented by the Geological Survey of Canada.*

- Canada—Hudson's Bay and Pacific Railway.** **Harris.**
Direct Route through the North-West Territories of Canada to the Pacific Ocean. The Chartered Hudson's Bay and Pacific Railway Route. (With a map.) By Colonel Josiah Harris. London: Spottiswoode & Co., 1897. Size 9½ x 6½, pp. 66. *Presented by the Author.*

The author's desire is "to silence the unsupported and mischievous impressions that Hudson's straits and bay are rendered useless by ice for commercial purposes," and "to bring forward indubitable evidence to prove that the straits are open for navigation during a longer period even than the Gulf of St. Lawrence."

- Canada—North-West Tribes.** *Rep. British Assoc. (1896): 549-591.*
The North-Western Tribes of Canada. Eleventh Report of the Committee.

- Canada—Nova Scotia.** *P. and T. Nova Scotia L. Sci. 9 (1896): 180-194.* **Bailey.**
Some Nova Scotian Illustrations of Dynamical Geology. By Prof. L. W. Bailey, F.R.S., etc. *With Three Plates.*

- Canada—Nova Scotia.** *P. and T. Nova Scotia L. Sci. 9 (1896): 124-146.* **Gilpin.**
The Underdeveloped Coal Fields of Nova Scotia. By E. Gilpin, Jr., M.D., etc.

- Lake Superior.** *National G. Mag. 3 (1897): 111-120.* **Harrington.**
Area and Drainage Basin of Lake Superior. By Dr. Mark W. Harrington.

- United States—Wisconsin.** *J. Geology 5 (1897): 131-147.* **Salisbury and Atwood.**
Drift Phenomena in the Vicinity of Devil's Lake and Barabou, Wisconsin. By Rollin D. Salisbury and Wallace Walter Atwood. *With Maps, etc.*

A summary of the results of practical work by the students of Chicago University in the Field Geology class.

CENTRAL AND SOUTH AMERICA.

- Argentina.** *Aus allen Weltteilen 28 (1897): 337-344.* **Semler.**
Die Zukunft des Deutschlands in Argentinien. Von Franz Semler.

Propounds a scheme for the economic conquest of the Argentine Republic, by concentrating the divergent streams of German emigration towards that country, for which—though not for its present government—the author foresees a great future.

- Brazil.** *Vech. Ges. Erdk. Berlin* 24 (1897): 172-193. **Mayer.**
Herr Dr. Herrmann Meyer: Über seine Expedition nach Central-Brazilien. *Witt.*
Map.

This journey will be specially noticed. A note on the journey appears in the *April Journal*, p. 447.

- Chili and Argentine.** *Z. Ges. Erdk. Berlin* 52 (1897): 23-61. **Steffen.**
Die chilenisch-argentinische Grenzfrage mit besonderer Berücksichtigung Patagoniens. Von Dr. Hans Steffen. *Witt.* *Map.*
Also a separate copy. *Presented by the Author.*

- Cuba.** **Amabile.**
La Question Cubaine et le Conflit Hispano-Américain, Conférence . . . par Y. Mestre Amabile. Paris, 1896. Size 10 x 7, pp. 125. *Portraits and Maps.* *Presented by the Author.*

- Guatemala.** *Globus* 71 (1897): 189-191. **Sapper.**
Die Volksdichtigkeit der Republik Guatemala. Von Dr. Karl Sapper. *Witt.*
Map.
An estimate of the distribution of population in the republic of Guatemala, with a map of the density of population.

- Jamaica—Cartography.** **Cundall.**
Jamaica Cartography. Chronological List of the Maps of Jamaica in the Library of the Institute of Jamaica, both on separate sheets and in books, with some Notes on the History of the Parishes of the Island. By Frank Cundall, F.R.S. Reprinted from 'The Handbook of Jamaica for 1897.' Kingston, Jamaica. Size 8½ x 6, pp. 16. *Presented by the Author.*
The list of maps is accompanied by an account of the origin of some of the modern place-names in Jamaica.

- Paraguay.** **Santos.**
La República del Paraguay. Por Carlos R. Santos. Asunción—H. Kraus, 1897. Size 7 x 5½, pp. viii, and 146. *Presented by Mr. Christopher James, Consul-General for Paraguay.*

- Peru.**
Memorandum sobre el proyecto de Ferrocarril de la Oroya al Puncosambo que el Presidente de la Sociedad Geográfica de Lima, presenta al Gobierno. Lima, 1897. Size 12½ x 8½, pp. 44.

- Peru.** *B.S.G. Lima* 4 (1896): 19-42.
Itinerario de los viajes de Rainoldi en el Perú. De Lima a Morococha.

- South America.** *Scottish G. Mag.* 13 (1897): 189-200. **Vincent.**
The British in South America. By Col. Sir Howard Vincent, C.B., M.P.

AUSTRALASIA AND PACIFIC ISLANDS.

- Australasia.** **Thomson.**
Geography in Australasia. Anniversary Address to the Royal Geographical Society of Australasia, Brisbane, by the President, J. P. Thomson. Delivered at the Anniversary Meeting of the Society, July 22, 1896. Size 9 x 6, pp. 22.

- Australia.**
The Australian Mining Standard. Special West Australian and N.S.W. Edition. Sydney and Melbourne, August, 1896. Size 15½ x 10½, pp. [42]. *Illustrations.* Price 6d. *Presented by the Publishers.*

- Navigation.**
The Australian Directory. Volume I. South and East Coasts from Cape Leeuwin to Port Jackson, including Bass Strait and Tasmania. Originally compiled by Captain Charles B. Yule, R.N. Ninth Edition. London: J. D. Potter, 1897. Size 9½ x 6½, pp. xxii, and 900. *Index Chart.* Price 5s. *Presented by the Hydrographer of the Admiralty.*

- New Caledonia.** *B. Union G. Nord de la France* 17 (1896): 125-135. **Dubois.**
La Nouvelle Calédonie. Par M. Marcel Dubois.
An appreciation of the value to France of this colony.

New South Wales—Broken Hill.

The Silver Sulphides of Broken Hill. Special Edition of the Australian Mining Standard, January 30, 1897. Sydney and Melbourne. Size $15\frac{1}{2} \times 10\frac{1}{4}$, pp. 32. Illustrations. Price 1s. Presented by the Publishers.

POLAR REGIONS.

Arctic—Davis' and Baffin's Bay. *American J. Science* (4) 3 (1897): 313-329. Tarr.
Difference in the climate of the Greenland and American sides of Davis' and Baffin's Bay. By Ralph S. Tarr.

Greenland. *Tæner* 17 (1897): 21-29. Andersen.

En Sommerrejse i Diskubugten og Umanakfjorden. Af Astrid Andersen.
A summer voyage to Disco Bay and the Umanak fjord in 1893.

Greenland. *National G. Mag.* 9 (1897): 97-110. Putnam.

A Summer Voyage to the Arctic. By G. R. Putnam. With Map and Illustrations.
Notes on a visit to the Umanak fjord in the summer of 1896.

Spitzbergen. Conway.

The First Unveiling of Spitzbergen, being an account of an inland journey of exploration and survey, with descriptions of several Mountain Arcosis, of Boat Expeditions in Ice Fjord, of a Voyage to North-East-Land, the Seven Islands, down Hinlopen Strait, nearly to Wilkes Land, and into most of the Fjords of Spitzbergen, and of an almost complete circumnavigation of the main island. By Sir William Martin Conway. With contributions by J. W. Gregory, n. c., A. Trevor-Batlyn, and E. J. Garwood. London: J. M. Dent & Co., 1897: Size $10 \times 7\frac{1}{2}$, pp. xii and 372. Maps and Illustrations. Price 30s. Presented by the Author.
This work will be noticed separately.

Spitzbergen. *Tæner* 17 (1897): 12-16. Strindberg.

Karh Öfver Ansterdamska med angifningar. Af Nils Strindberg. With Maps.
On the map of Amsterdam Island, on the coast of Spitzbergen.

MATHEMATICAL GEOGRAPHY.

Decimal Angles. *R.S.G. de l'Est* (1896): 230-231. Barbier.
Géographie mathématique: De la nécessité de partager les feuilles de la carte du Monde en $1/1,000,000$ (projet Penck), en sections décimales de la circonférence et, spécialement, de préférence, par zones de $4^{\circ} 30'$ de latitude ou hauteur correspondant à 5 grades. 2^e Rapport présenté au Congrès de Lorient. Par M. J. V. Barbier.

Earth Rotation Influences. *Meteorolog. Z.* 14 (1897): 81-91. Sprung.
Die vertikale Komponente der ablenkenden Kraft der Erdrotation und ihre bewegenden Wirkungen. Von A. Sprung.

Geodesy. Weiss and Schram.
Publicationen für die Internationale Erdmessung. Astronomische Arbeiten des K. K. Gradmessungs-Büros ausgeführt unter der Leitung des Hofrathes Theodor v. Oppolzer. Nach dessen Tode herausgegeben von Prof. Dr. Edmund Weiss und Dr. Robert Schram. VIII. Band. Breiten-, Azimut-, und Winkelbestimmungen. Wien: J. Tempelsky, 1896. Size $12\frac{1}{2} \times 9\frac{1}{4}$, pp. 212.

Nautical Almanac.

The American Ephemeris and Nautical Almanac for the year 1899. Washington: Bureau of Equipment, 1896. Size $11 \times 7\frac{1}{4}$, pp. 338. Diagrams.

Time. *Rev. Scientifique* (4) 7 (1897): 419-425. Lallemand.
L'unification internationale des heures et le système des fuseaux horaires. Par M. Ch. Lallemand.

A clear and logical statement of the reasons why France should concur in the system of hour-zones now accepted by almost all other countries in Europe, by Japan, Australia, and North America. It has been already proposed in the French parliament, "That the legal time in France and Algeria shall be the mean time of Paris retarded by 9 minutes 21 seconds."

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

- Atmosphere.** *Rev. Scientifique* (4) 7 (1897): 488-497. **Graffigny.**
Les sondages de la haute atmosphère. Par M. Henri de Graffigny. *With*
Diagrams.

Notes on recent ascents of balloons with registering instruments, but without
 aéronauts. Three of the French ascents reached heights of 43,276, 49,213, and 50,854
 feet respectively, the greatest elevation in the atmosphere from which meteorological
 observations have yet been obtained.

- Earth's Crust.** *Science* 5 (1897): 321-330. **Le Conte.**
Earth-crust Movements and their Causes. By Joseph Le Conte.

A clear and orderly summary of the classes of Earth-crust movements which have
 given rise to oceanic and continental forms, mountain ranges, and oscillations of level.
 A note on the conclusions will be given in the Monthly Record.

- Ice Caves.** *J. Franklin I.* 143 (1897): 161-178. **Balch.**
Ice Caves and the Causes of Subterranean Ice. By Edwin Swift Balch. *With*
Illustrations.
 Also separate copy. *Presented by the Author.*
 A note will be given in the Monthly Record.

- Limnology—Origin of Lakes.** **Swerinzew.**
Zur Entstehung der Alpenseen. (Beiträge zur Morphologie der Erdoberfläche.)
 Eine geologisch-geographische Studie. Von Dr. Phil. L. Swerinzew. St. Peters-
 burg, 1896. Size 9 x 6, pp. 36. *Illustrations.*
 This will be referred to elsewhere.

- Meteorology.** **Fassig.**
U.S. Department of Agriculture, Weather Bureau. Bulletin No. 11—Part iii.
Report of the International Meteorological Congress, held at Chicago, Ill., August
21-24, 1893, under the auspices of the Congress Auxiliary of the World's Columbian
Exposition. Part III. Edited by Oliver L. Fassig, Secretary. Washington, 1893.
Size 2½ x 6, pp. 585-772. Plates. Presented by the U.S. Department of Agriculture.
 The reports on questions of geographical interest are separately mentioned.

- Meteorology.** *National G. Mag.* 8 (1897): 65-82. **Moore.**
Storms and Weather Forecasts. By Professor Willis L. Moore. *With Charts.*

- Oceanography.** *P. Zoology, S.* 1898 (1897): 991-996. **Fowler.**
Contributions to our Knowledge of the Plankton of the Euxine Channel.—No. 1.
By G. Herbert Fowler, B.A., F.R.S. *With Plate.*
 Dr. Fowler was on board H.M.S. *Research*, the physical results obtained by which
 were noted in a recent number.

- Plant Geography.** *Förhänd. Vidensk.-S. Christiania,* 1894 (1895): 1-44. **Dahl.**
Plantogeografiska undersökningar i ydre Skandnavia, 1894. Af Ove Dahl.

- Seismology.** *Rep. British Assoc.* (1896): 189-239. **Milne.**
Seismological Investigation.—First Report of the Committee. *With Diagrams.*
 This report includes three contributions by Prof. Milne, and other contributions by
 Profs. Turner, Perry, Knott, and Dr. C. Davidson.

- Terrestrial Magnetism.** **Schmidt.**
Ueber die Nothwendigkeit einer Vervollständigung des Netzes der erdmagne-
tischen Observatorien. Von Dr. A. L. Schmidt.—*Beiträge zur Geophysik. Heraus-*
gegeben von Prof. Dr. Georg Gerland. III. Band. 2. Heft. Pp. 225-246.
 Leipzig: W. Engelmann, 1897. Size 9 x 9.

- Terrestrial Magnetism.** **Schwerer and Guyon.**
Ann. Hydrographiques (2) (1896): 71-187.
Observations magnétiques nées à bord du croiseur le Dubouche. Par M. le
 lieutenant de vaisseau Scherer. Méthode de réduction des observations. Par M.
 le capitaine de frégate E. Guyon. *With Plates.*

- Tidal Rivers.** **Hauteroux.**
Amélioration d'une rivière à marée. Par M. Hauteroux.—*Congrès National des*
Sociétés Françaises de Géographie. 10^e Session. Bordeaux, Août 1895. *Compte*
Rendu. Bordeaux, 1896. Size 10 x 6½, pp. 167-174.

- Upper Atmosphere.** *C.R.I.* 124 (1897): 486-488. **Cailliet.**
 Sur les appareils employés pour recueillir l'air à grande hauteur, dans l'ascension de l'*Aérophile* du 18 février 1897. Analyse de l'air recueilli. Note de M. L. Cailliet.
- Volcanic Action.** *P. Boston S. Nat. Hist.* 27 (1896): 89-106. **Shaler.**
 Conditions and Effects of the Expansion of Gases from the Earth. By N. S. Shaler.
- Volcanoes.** *R.S.G. Rochester* 18 (1896): 271-274. **Delauney.**
 Distribution géographique des volcans: Terre, Lune, Soleil. Par M. Delauney.
 A classification of 175 active terrestrial volcanoes in latitude and in longitude, a similar grouping of the centers visible in the moon, and a few remarks on sunspots. The author concludes that the distribution of solar, lunar, and terrestrial volcanoes is "in complete identity from the geographical point of view."
- Zoogeography.** *Mém. A. Imp. Sci. St.-Petersbourg* (3) 3 (1895): 1-36. **Böcher.**
 Das allmähliche Aussterben des Wisent [Bison bonasia (Linn.)] im Forste von Hjalowjescha. Von Eug. Böcher.
 On the dying out of the primitive bison in the forests of Byelovyjesha, in Grodno.
- Zoogeography.** *Globus* 71 (1897): 85-89. **Nehring.**
 Einige Bemerkungen über Anton Wieds 'Moscovia' und das zugehörige Urabild. Von Prof. Dr. A. Nehring. With illustrations.
- Zoogeography—Scala.** **Gravé.**
Abbe K. Leopoldinisch-Carulla, Deutsch. A. Naturforscher 66 (1896): 287-292.
 Die geographische Verbreitung der Pinnipedia. Von Carl Gravé. With Maps.
 On the distribution of the different genera and species of seals, with four maps, on which the habitat of each species is distinguished.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

- Historical—Recent Progress.** *Knowledge* 20 (1897): 60-83. **Mill.**
 The Victorian Era in Geography. By Hugh Robert Mill, n.s. With Maps.
 A sketch of geographical exploration by land during the last sixty years. The maps intended to illustrate the paper were inserted without being submitted to the author, and are not correct.
- Historical Maps.** *Riv. G. Italiana* 3 (1896): 50-57, 388-390, 520-577. **Errera.**
 Atlanti e Carte nautiche dal secolo XIV. al XVII. conservati nella biblioteca pubblica e privata di Milano. Note di Carlo Errera.
 On atlases and marine charts between the fourteenth and seventeenth centuries.
- History of Geography.** **Beasley.**
 The Dawn of Modern Geography. A History of Exploration and Geographical Science from the Conversion of the Roman Empire to A.D. 900, with an Account of the Achievements and Writings of the Early Christian, Arab, and Chinese Travellers and Students. By C. Raymond Beasley. With reproductions of the principal Maps of the time. London: John Murray, 1897. Size 9 x 6, pp. xvi. and 508. Price 18s. Presented by the Publisher.
 The scope of this history, which was reviewed in the May Journal, p. 572, is the period between A.D. 800 and 900, and is mainly confined to the Christian writings of that period, the Arabic and Chinese works being referred to at much less length.

BIOGRAPHY.

- Bahnsen.** **Stolpe.**
Foer 17 (1897): 77-80.
 Kristian Bahnsen. Af Hjalmar Stolpe. With Portrait.
 Biography of a Danish ethnologist who had travelled in Northern Europe and Greenland.
- Hakluyt.** **Markham.**
 Richard Hakluyt: his Life and Work. With a short account of the aims and achievements of the Hakluyt Society. An Address delivered by Sir Clements Markham, K.C.M.G., F.R.S. (President), on the occasion of the Fiftieth Anniversary of the Foundation of the Society, December 15, 1896. London: 1896. Size 8½ x 5½, pp. 26. Presented by the Author.

- Pisa.** *L'Universo* 7 (1897): 100-100.
Viaggiatori Italiani. Ugo Pisa.
- Wharton.** *Nautical Mag.* 66 (1897): 279-281.
The Editor's Album: Rear-Admiral Wharton, C.B., F.R.S. Hydrographer to the Admiralty. With Portrait.

GENERAL.

- Admiralty—Hydrographic Department.** *Nautical Mag.* 66 (1897): 316-303. Lord.
The Hydrographic Department. By W. B. Lord.
- Australian Geographical Society—Queensland.** Muir.
The Royal Geographical Society of Australasia, Queensland: an Historical Review. By Alexander Muir, J. P., Vice-President. [Read at the Annual General Meeting of the Society, July 17, 1896.] Size 8 x 6, pp. 20.

- Bibliography.** Margerie.
Congrès Géologique International. 5^e Session. Washington, 1891.—6^e Session. Zürich, 1894. Catalogue des Bibliographies géologiques, rédigé, avec le concours des Membres de la Commission Bibliographique du Congrès. Par E. de Margerie. Paris: Gauthier-Villars et Fils, 1896. Size 10 x 6½, pp. xx. and 784. Presented by the Author.
This will be specially noticed.

- Bibliography.**
Catalogue des Livres de la Société de Géographie de Genève au 1^{er} Janvier, 1897. Genève: R. Burkhardt, 1897. Size 9½ x 6½, pp. x. and 34.

- British Colonies.** *J. R. Colonial L.* 28 (1897): 335-368. Lowe.
The Dairy Industry in the Colonies. By Samuel Lowe.

Commercial Geography.

Special Consular Reports. Money and Prices in Foreign Countries, being a series of Reports upon the currency systems of various nations in their relation to prices of commodities and wages of labor. Vol. xiii.—Part II. Washington, 1897. Size 9½ x 5. Presented by the United States Department of State.

These are supplementary reports received too late for the first part of the publication, which is now practically complete for all countries.

- Commercial Geography—Indiarubber.** *National G. Mag.* 3 (1897): 83-88. Greely.
Rubber Forests of Niamragus and Sierra Leone. By General A. W. Greely.

- Educational—Methods.** *Le Globe* 36, 1896-1897 (1897): 55-62. Naville.
Réflexions sur l'enseignement de la géographie, et exposé des principes d'après lesquels on se propose de rédiger de nouveaux éléments de cette science. Mémoires de l'É.-J.-M. Naville (1896).

A striking appeal made seventy years ago for the unity of geography as an educational subject.

- Educational—Methods.** Wethey.
A Geography Lesson: the Blackboard and Oral teaching. By E. R. Wethey, N.A. Printed by request of the Geographic Association. London: G. Philip & Son, 1896. Size 8½ x 5½, pp. 14. Illustrations.
A note will be given on this paper.

- Educational—Methods.** *J. School Geography* 1 (1897): 2-7. Davis.
Home Geography. By William M. Davis.

- Educational—Methods.** *J. School Geography* 1 (1897): 48-51. McMurtry.
The Casual Notion in Geography. By F. M. McMurtry.

- Educational—Methods.** *J. School Geography* 1 (1897): 10-14. Monroe.
Geographic Instruction in Germany. By Will. S. Monroe.

- Geographical Museum.** *B.S.G. de l'Est* (1896): 205-210. Despléques.
Géographie économique: Le musée industriel et commercial et le musée

géographique de la section mensuelle de la Société de géographie de l'Est à Bar-le-Duc. Par Paul Despiques.

A geographical museum has been established at Bar-le-Duc, with sections for local and general geography, and collections of maps, photographs, ethnographic, and commercial objects, etc.

Geographical Speculation.

Scott-Elliot.

The Story of Atlantis. A geographical, historical, and ethnological sketch. Illustrated by Four Maps of the World's Configuration at different periods. By W. Scott-Elliot. With a Preface by A. P. Sluyst. London: Theosophical Publishing Society, 1896. Size 9½ x 6, pp. xii. and 72. Presented by "Z."

An interesting specimen of "paradoxical" speculation, illustrating the great need which still exists for elementary scientific instruction.

Geographical Year-book.

Wagner.

Geographisches Jahrbuch. XIX. Band, 1896. . . herausgegeben von Hermann Wagner. Gotha: Justus Perthes, 1897. Size 9 x 6, pp. viii. and 456.

A note on this volume is given in the Journal for April, vol. 9, p. 451.

German Colonies.

Meinecke.

Koloniales Jahrbuch. Beiträge und Mittheilungen aus dem Gebiete der Kolonialwissenschaft und Kolonialpraxis. Herausgegeben von Gustav Meinecke. Neunter Jahrgang. Berlin: Deutscher Kolonial-Verlag, 1897. Size 10 x 6½, pp. 322.

German Colonies.

Weisbuch. Stabzehnter Theil. Berlin: Carl Heymanns Verlag, 1897. Size 12½ x 9½, pp. 190.

This number contains the annual reports for the protectorates of Togo, Cameroons, German East Africa, German South-West Africa, and the Marshall Islands for 1896, and the text of various concessions granted in South-West Africa.

Hungarian Geographical Society. *Abrégé B.S. Hongroise G. 24* (1896): 65-73. Erökl.

Coup d'œil sur l'activité de la Société Hongroise de Géographie depuis sa fondation. Par Dr. Béla Erökl.

Museum Catalogue.

A Guide to the Fossil Invertebrates and Plants in the Department of Geology and Palaeontology in the British Museum (Natural History), Cromwell Road, London, S.W. Printed by order of the Trustees, 1897. Size 8½ x 6½, pp. xvi. and 158. Illustrations. Price 1s. Presented by the Trustees of the British Museum.

Museum Catalogue.

A Guide to the Fossil Reptiles and Fishes in the Department of Geology and Palaeontology in the British Museum (Natural History), Cromwell Road, London, S.W. Printed by order of the Trustees, 1896. Size 8½ x 6, pp. xiv. and 130. Illustrations. Price 6d. Presented by the Trustees of the British Museum.

Museum Catalogue.

A Guide to the Fossil Mammals and Birds in the Department of Geology and Palaeontology in the British Museum (Natural History), Cromwell Road, London, S.W. Printed by order of the Trustees, 1896. Size 8½ x 6½, pp. xii. and 104. Illustrations. Price 6d. Presented by the Trustees of the British Museum.

Museum Catalogue.

Piehl Columbian Museum Publication 14. Report Series. Vol. 1. No. 2. Annual Report of the Director to the Board of Trustees for the year 1895-96. Chicago, 1896. Size 10 x 6½, pp. [84].

Navigation.

Moore.

The New Rules of the Road at Sea, being the Regulations for preventing Collisions at sea, 1897. With explanatory Notes and Observations on the Law relating thereto. By H. Stuart Moore. London: J. D. Potter, 1897. Size 10 x 6½, pp. 84. Price 3s. Presented by the Publishers.

A clear statement of the new rules of the road at sea, with illustrations drawn from reports of law cases.

Navigation—Dock Book.

Additions and Corrections to Dock Book, 1894, to 31st December, 1895. London: J. Potter, 1896. Size 12½ x 8½, pp. 40. Price 1s. 6d. Presented by the Hydrographic Office, Admiralty.

Particulars of all the docks available for ship-repairs in existence at the close of 1895.

Navigation—List of Lights.

The Admiralty List of Lights, 1897. Part i. The British Islands (pp. 213, price 1s. 6d.); Part ii. Eastern Shores of the North Sea (pp. 188, price 2s.); Part iii. Baltic Sea (pp. 201, price 2s.); Part iv. Western Coasts of Europe and Africa (from Dunkerque to the Cape of Good Hope), including Azores, Madeira, Canary, Cape Verde Islands, etc. (pp. 144, price 1s. 6d.); Part v. The Mediterranean, Black, Azov, and Red Seas (pp. 248, price 1s. 6d.); Part vi. South Africa, East Indies, China, Japan, Australia, Tasmania, and New Zealand (pp. 248, price 2s.); Part vii. South America, Western Coast of North America, Pacific Islands, etc. (pp. 22, price 1s.); Part viii. Eastern Coasts of North and Central America (from Labrador to the River Amazon), including Bermuda and Islands of the West Indies (pp. 216, price 2s. 6d.). London: J. D. Potter, 1897. Size 10 x 6 $\frac{1}{2}$. Presented by the Hydrographic Office, Admiralty.

New Cosmogony. *R.S. Languedoc G.* 19 (1896): 142-184, 337-377. Duponchel.
Nouvelle théorie cosmogonique. Le vide dans le plein. Par M. A. Duponchel.

North Pacific Ocean. *Science* 6 (1897): 455-457.

Proposed Exploration on the Coasts of the North Pacific Ocean.
A note on this subject was given in the *May Journal*, p. 568.

Orthography. *Ann. G.* 6 (1897): 14-22. Aitoff.

De la transcription des noms géographiques. Par M. D. Aitoff.

On the transliteration of Russian into Roman letters for the use of French-speakers.

Pacific Cable. *Blackwood's Mag.* 161 (1897): 269-279.

The All-British Trans-Pacific Cable.

Discusses mainly the economic conditions of the proposed cable.

Royal Society—Year-Book.

Year-book of the Royal Society, 1896-97. No. 1. London: Harrison & Sons, 1897. Size 8 $\frac{1}{2}$ x 5 $\frac{1}{2}$, pp. 134. Price 5s. Presented by the Royal Society.

This is the first number of a very useful book of reference containing the laws of the Royal Society, a list of the Fellows, exchanges, the year's additions to the Library, the President's annual address, and other matters. This example is one which might profitably be followed by other societies.

Travel.

Madden.

The Wilderness and its Tenants. A Series of Geographical and other Essays Illustrative of Life in a Wild Country. Together with experiences and observations culled from the great book of Nature in many lands. By John Madden. 3 vols. London: Simpkin, Marshall & Co., 1897. Size 9 x 6, pp. (vol. i.) xvi. and 462; (vol. ii.) 506; (vol. iii.) 531. Frontispiece. Price 42s.

These volumes contain a world of laborious research in books, and many pleasant reminiscences of travel. Although some of the references are not very critically selected, and the matter is not very scientifically arranged, the whole is animated by a spirit of enthusiastic appreciation for Nature, and the work embodies many interesting geographical facts not previously brought together.

Travels.

Dodge.

As the Crow Flies. From Corsica to Charing Cross. By Walter Phelps Dodge. New York: O. M. Allen Company, 1893. Size 7 $\frac{1}{2}$ x 4, pp. 132. Presented by the Author.

Light sketches of visits to various European pleasure-resorts.

Underground Water.

Thomson.

The Alleged Leakage of Artesian Water. Abstract from an Address delivered to the Members of the Royal Geographical Society of Australasia (Queensland), at a Special Meeting, January 17, 1896. By J. P. Thomson, President. Size 9 x 6, pp. 14. Presented by the Author.

NEW MAPS.

By J. COLES, *Map Curator, R.G.S.*

EUROPE.

Balkan Peninsula.

Scheda.

Josef v. Scheda's Generalkarte der Balkan-Halbinsel. Scale 1: 864,000 or 136 stat. miles to 1 inch. Umarbeitung von A. Steinhauser. 13 Blätter. Verlag von Artaria & Co., Wien, 1897.

This is a new edition of Scheda's well-known map of the Balkan peninsula, and is specially suited for reference at the present time. It contains an excellent plan of Constantinople on the scale of 2½ inches to a mile.

England and Wales.

Ordnance Survey.

Publications issued since April 8, 1897.

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ENGLAND AND WALES:—140, 141, 214, 216, revised, engraved in outline, 1s. each.

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ENGLAND AND WALES:—Durham (revision), VII. 4, 6, 7; VIII. 14; XIII. 16; XIV. 3; XXV. 14, 15, 16; XXVI. 12, 13, 14, 16; XXVII. 10, 12, 13, 14, 15, 16; XXVIII. 9, 10, 11, 12; XXIX. 9; XXXII. 4, 6, 7, 8; XXXIII. 1, 2, 3, 5; XXXVIII. 4; XXXIX. 1, 2, 3, 4, 12; XL. 1, 2, 3a each. Essex (revision), XXXIV. 5, 6, 8, 10, 11, 12, 13, 15, 16; XXV. 13, 15, 16; XXXII. 2, 3, 4, 5, 6, 8, 9, 10, 13, 14, 15, 16; XXXIII. 2, 4, 8; XXXIV. 2, 3, 7, 16; XXXV. 1, 2, 3, 6, 9, 11, 12, 13, 14, 15; XXXVI. 6; XLI. 7, 8; XLII. 2, 3, 5, 8; XLIII. 13; XLV. 5, 9, 10, 14, 15, 16; L. 13; LIV. 1, 3, 7, 8, 12, 13, 14, 15, 16; LVII. 14; LIX. 2; LXIII. 1, 3; LXV. 2, 3; LXX. 13, 15; LXXIV. 16; LXXV. 3, 7, 8; LXXVI. 12, 13, 15; LXXVII. 10, 11, 14; LXXVIII. 1, 2, 4; LXXXII. 4, 8; LXXXIII. 2, 11; LXXXIV. 3, 3a each. Hampshire (revision), XX. 8, 16; XXXVI. 3; XLVIA. 15; XLVIII. 7; XLIX. 15; L. 1, 16; LI. 4, 8, 15; LIV. 4, 8, 11, 13, 14, 15, 16; LIVA. 2, 3, 6, 7, 8, 11, 12; LV. 9; LXIIa. 4; LXIII. 1, 2, 3, 4; LXIV. 3, 5; LXV. 9, 14; LXVIII. 13, 3a each. Kent (revision), III. 15; XII. 3, 8; XVIII. 8; XX. 9, 14; XXVII. 12, 16; XLII. 4, 15, 16; XLIX. 6, 11; LI. 7, 14; LII. 1, 2, 3, 6, 7, 10, 11; LX. 1, 9, 13, 14; LXI. 2, 5, 7, 8, 9, 11, 12, 13, 14, 15, 16, 3a each. Middlesex (revision), XX. 4, 8, 11, 15; XXI. 2, 12; XXIV. 13, 16; XXV. 4, 3a each. Northumberland (revision), VIII. 11, 12, 15; LIV. 9, 10, 11, 12, 13, 14, 15, 16; LV. 9, 10, 11, 12, 13, 14, 15, 16; LVI. 14; LX. 7, 8, 15; LXI. 5, 6, 7, 8; LXII. 3; LXIII. 2, 3, 4, 8, 16; LXIV. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16; LXV. 1, 3, 9, 13, 14; LXXII. 1, 3, 6, 8, 12; LXXIII. 6; LXXV. 16; LXXVI. 13; LXXIX. 4; LXXX. 5, 6, 7, 9, 10, 11, 12, 14; LXXXI. 3, 6, 3a each. Surrey (revision), V. 3, 10; X. 2, 3; XI. 8; XII. 8; XIV. 16; XV. 6, 7, 8; XX. 8, 14; XXIII. 11, 15; XXXI. 16; XXXII. 9; XXXV. 13, 14, 15, 16; XXXIX. 15; XLI. 13; XLII. 4; XLVI. 1, 2, 3, 4, 5, 6, 8, 9, 3a each. Sussex (revision), II. 11; III. 16; IV. 5; XIII. 2; XXI. 3, 4, 7; XXIII. 1, 2, 3, 5, 6, 9, 11, 3a each.

County Indexes. The following county indexes, showing 25-inch divisions only, coloured in parishes, are now published: Bedfordshire, Breconshire, Cardiganshire, Carmarthenshire, Carnarvonshire, Northamptonshire, Pembrokeshire, Radnorshire, price 6d. each.

(E. Stanford, Agent.)

ASIA.

Java.

Dornseiffen.

Java op een Schaal van 1: 950,000 (or 151 stat. miles to an inch). Naar de nauwste bronnen bewerkt onder toezicht van Dr. I. Dornseiffen. Herzien door R. de Geest. Amsterdam. Seyffant's Boekhandel. 1896. 4 sheets.

Although this map is by no means clearly drawn, it contains a large amount of useful information with regard to administrative divisions, means of communication

and submarine telegraph cables. It contains a plan of Batavia on an enlarged scale, and a description is given of the symbols employed in the map.

Sumatra.**Dornseiffen and Pleyte.**

Soematra, Rongken en de Riouw-Lingga-Archipel. Schaal 1 : 1,000,000 (or 15·8 stat. miles to an inch.) Bewerkt door Dornseiffen, naar de jongste gegevens gewijzigd door C. M. Pleyte Wz. Amsterdam: Seyffardt's Boekhandel, 1896. 12 sheets. Price 7·50 francs.

This is a new edition of this map of Sumatra and the adjacent islands. Accompanying this map is a list of the maps and charts which have been employed by the authors in correcting and revising it.

AFRICA.**Africa.****Service géographique de l'Armée, Paris.**

Carte d'Afrique. Scale 1 : 2,000,000 or 31·3 stat. miles to an inch. Publié par le Service géographique de l'Armée. Révisé et complété en 1896. Sheet No. 39, San Salvador. Price 1 franc.

Algeria.**Service géographique de l'Armée, Paris.**

Carte d'Algérie. Scale 1 : 50,000 or 1·26 stat. miles to an inch. Sheets: 94, St. Arnaud; 112, Aumale. Dressé, héliogravé et publié par le Service géographique de l'Armée. Paris. Price 1·50 fr. each sheet.

East Africa.**Brard.**

Das Südrfer des Victoria-Nyanza. Von Peter Brard. Scale 1 : 750,000 or 11·8 stat. miles to an inch. *Petermanns Geographische Mittheilungen*, Jahrgang, 1897. Tafel 7. 1897. Gotha: Justus Perthes. Presented by the Publisher.

Matabeleland.**Fletcher and Espin.**

Map of Matabeleland. Scale 1 : 506,880 or 8 stat. miles to an inch. Compiled by Fletcher and Espin. Second Edition, 1897. Published by the Goldfields of Matabeleland, Ltd., and Edward Stanford, London.

This is the second edition of a map of Matabeleland which has previously been noticed in the *Geographical Journal*. It contains a considerable amount of new work, and has been corrected and brought up to date.

Niger River.**Hourst.**

Carte provisoire du Cours du Niger entre Tombouctou et Baidjibo. Mission Hydrographique du Niger. Membres de la Mission: MM. Hourst, commandant; Baudry, Bluxel, Taburet. R. P. Hacquard, 1896. Scale (approx.) 1 : 4,500,000 or 71 stat. miles to an inch. Société de Géographie de Paris. Presented by the Société de Géographie de Paris.

Tunisi.**Service géographique de l'Armée, Paris.**

Tunisie. Carte de Reconnaissance. Scale 1 : 200,000 or 31 stat. miles to an inch. Dressé, gravé et publié au Service géographique de l'Armée. Sheets xxxvii. Bir Ali. xi. Jemlon [no date]. Price 70 cents each sheet.

AMERICA.**Greenland.****Bay**

Geologische Karte des Scoresby-Sundes. Von E. Bay. Scale 1 : 1,500,000 or 23·0 stat. miles to an inch. *Petermanns Geographische Mittheilungen*, Jahrgang, 1897. Tafel 8. 1897. Gotha: Justus Perthes. Presented by the Publisher.

Peru.**Raimondi.**

Mapa del Peru. A. Raimondi. Scale 1 : 500,000 or 7·0 stat. miles to an inch. Engraved and printed by Erhard Bros., Paris. Sheets Nos. 21 and 23. [No date.]

These two sheets include the country east and south-east of Lima. An explanation of the symbols employed is given at the foot of each sheet. The map is printed in four colours, and some of the elevations above sea-level are given in metres. More than two-thirds of the sheets of this map have now been published; when complete, it will form the best map of Peru it is possible to compile from the imperfect material at present available.

GENERAL.

Educational.

Pennesi.

Atlante Scolastico per la Geografia Fisica e Politica di Giuseppe Pennesi. Istituto Cartografico Italiano. Roma. Price 15 7.50. [No date.]

This is a new edition of an atlas by the same author which was published in 1891-95 in two parts. Some alterations and additions have been made which have added to the value of the atlas, and the manner in which the political and physical maps have been arranged is worthy of special commendation. The maps are all nicely drawn, and are well suited for educational purposes.

German Colonies.

Langhans.

Deutscher Kolonial-Atlas. 30 Karten mit 300 Nebenkarten, entworfen, bearbeitet und herausgegeben von Paul Langhans. Erscheint in 15 Lieferungen (jede mit 2 Karten). Parts 11 and 12. Gotha: Julius Perthes, 1897. Price 1 mk. 60 pf. each part.

Part 11 contains No. 9, the first of a set of maps showing German colonization in the East, and No. 12 is sheet 2 of a four-sheet map showing the German possessions in the Kamerun district and Togoland. Part 12 contains No. 10, a map showing influence of German exploration and missionary work in Africa, together with the extent of German possessions in Africa. No. 14, sheet 4 of a four-sheet map of the Kamerun district and Togoland. In addition to the principal map, numerous insets are given.

Historical Geography.

Poole.

Historical Atlas of Modern Europe from the Decline of the Roman Empire: comprising also maps of parts of Asia and of the New World, connected with European History. Edited by Reginald Lane Poole, M.A., F.R.S. Lecturer in Diplomatic in the University of Oxford. Part vii. Oxford: The Clarendon Press. London, Edinburgh, and Glasgow: Henry Frowde. Edinburgh: W. & A. K. Johnston. 1897. Price 3s. 6d. Presented by the Clarendon Press.

Part vii. of this atlas contains the following maps: Sheet 3, four maps of Europe, from 565 A.D. to 729 A.D., with notes by Professor Bury. Sheet 18, England and Wales in the reign of Edward I., with notes by Professor Tout. Sheet 49, Russia, illustrating the growth of the Empire, from the Accession of the House of Romanov, 1613, with notes by R. Nisbet Bain.

CHARTS.

Chilian Charts.

Oficina Hidrográfica de Chile.

No. 63, Caleta Quiluil, Costa de Chile. No. 64, Bahía de Angud, Costa de Chile. Taller de la Oficina Hidrográfica de Chile, 1897. Presented by the Oficina Hidrográfica de Chile.

United States Charts.

U.S. Hydrographic Office.

Pilot Charts of the North Atlantic Ocean for April, 1897, and North Pacific Ocean for April and May, 1897. Published at the Hydrographic Office, Washington, D.C. Presented by the U.S. Hydrographic Office.

PHOTOGRAPHS.

China, Japan, and Korea.

Bishop.

Views in the Far East. Photographed by Isabella L. Bishop, F.R.S. Colotyped by S. Kajima, Tokyo. Presented by Mrs. Bishop.

This is a very beautiful series of colotype prints, by S. Kajima, Tokyo, from photographs taken by Mrs. Isabella L. Bishop in Korea, China, and Japan. They illustrate the scenery, buildings, and inhabitants of the different districts through which Mrs. Bishop travelled, and form a valuable addition to the Society's collection.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



A MAP OF PARTS OF
GHARIAN, TARHUNA,
AND
M'SALATA
(TRIPOLI)

By H. SWAINSON COWPER, F.S.A.
1895 and 1896

The Author's Routes in 1895.

Additional Routes in 1896.

Scale—1:200,000.

ALL BEARINGS ARE MAGNETIC.

Abu, Father.	Kom, Hillock.
Ain, Spring.	Marsa, Harbour.
Anlad, Children—Sons.	Mirabul, Saint's Tomb.
Beni, Son.	Ras, Head—Cape.
Bir, Wall.	Senam (S., Sen.), "Idol"
Fam, Mouth.	Wadi, Torrent—Ful.
Henshar, Fence or Enclosure.	Weiad, Son—Child.
Jebel, Mountain.	Zaush, Chapel.
Kasr, Castle.	





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